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COMPUTE!'s GAZETTE

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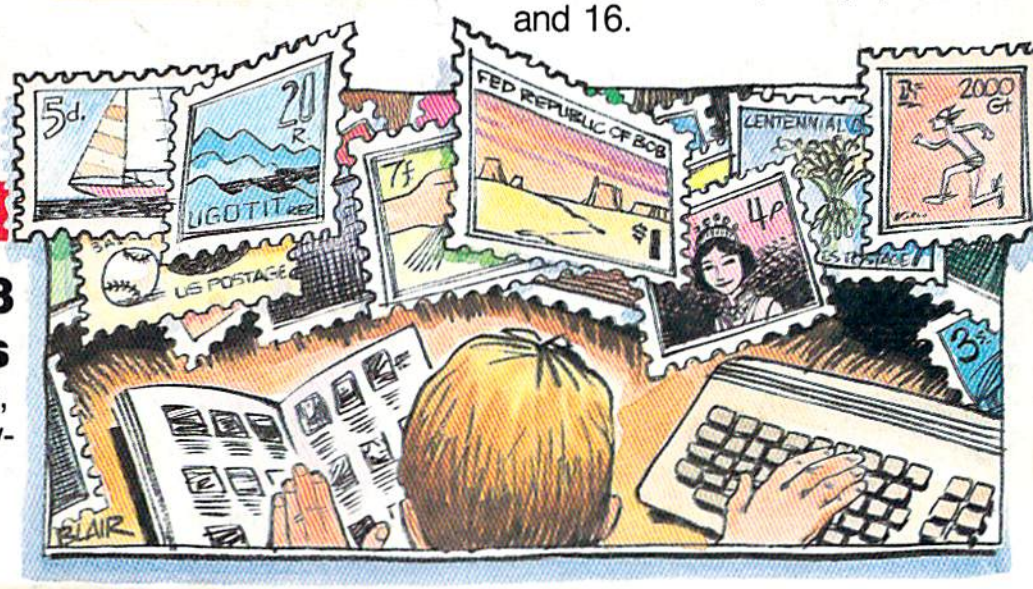

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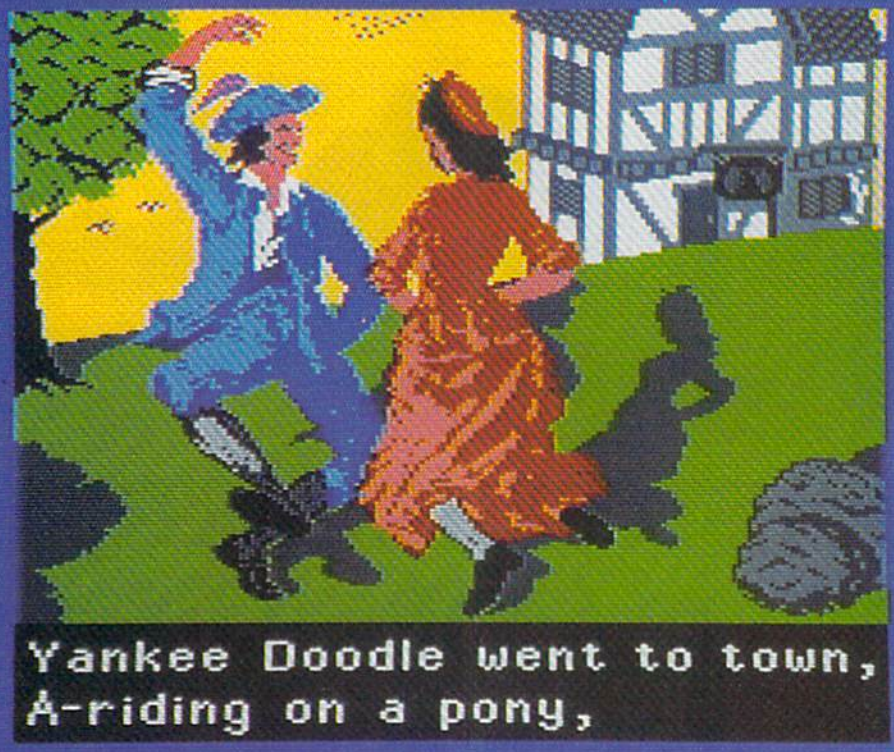

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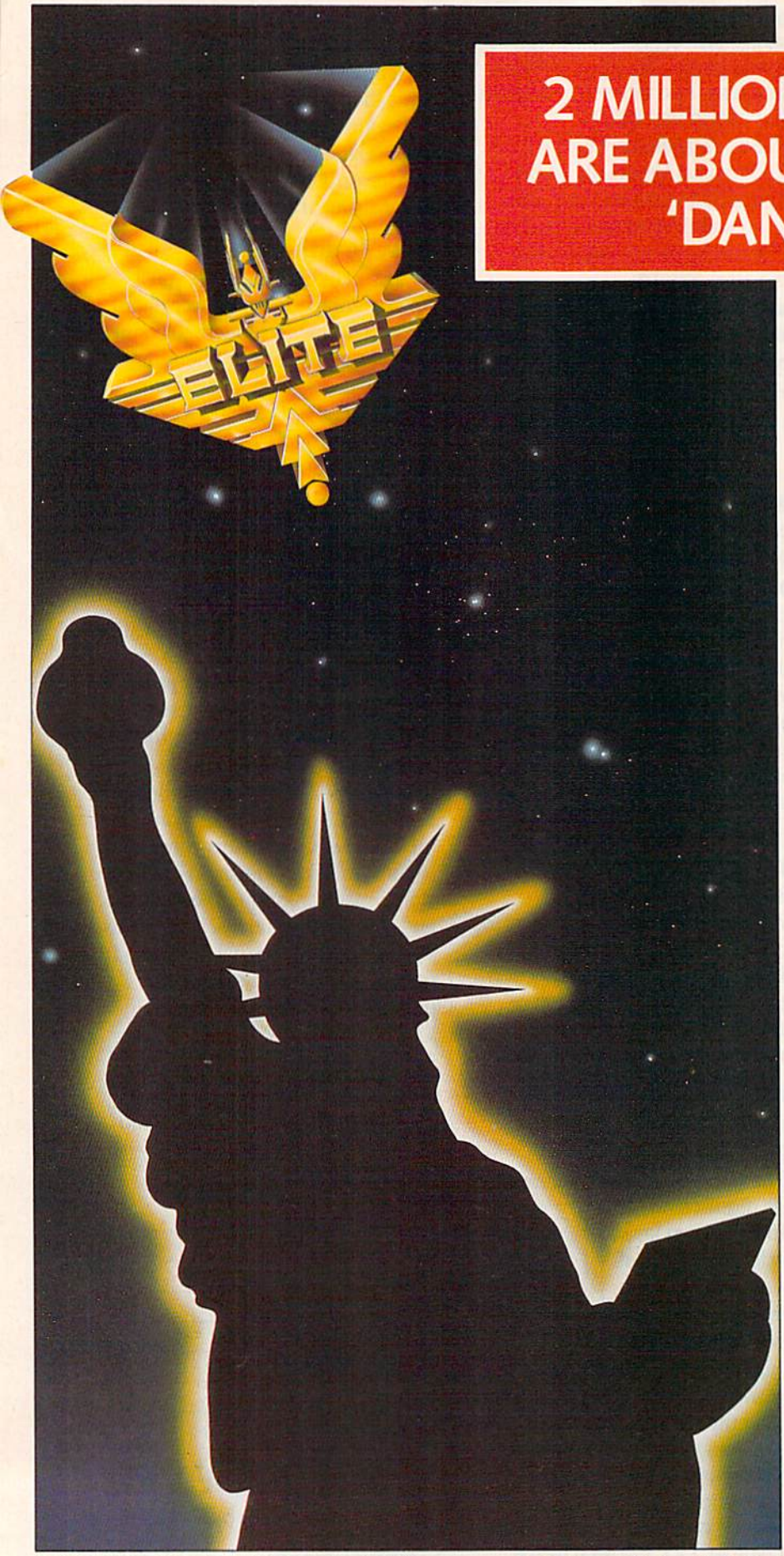

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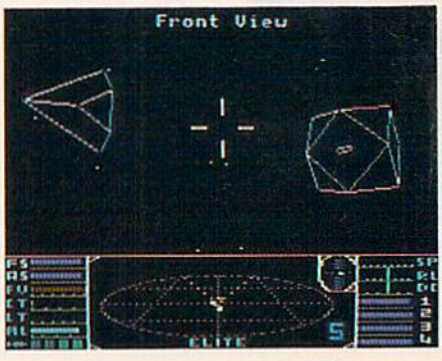

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† All Commodore 64 programs in this issue work on the Commodore 128 in 64 mode.

*=General, **V**=VIC-20, **64**=Commodore 64, **+4**=Plus/4, **16**=Commodore 16, **128**=Commodore 128

COMPUTE!'s GAZETTE is published monthly by **COMPUTE!** Publications, Inc., Post Office Box 5406, Greensboro, NC 27403 USA. Phone: (919) 275-9809. Editorial offices are located at 324 West Wendover Avenue, Greensboro, NC 27408. Domestic Subscriptions: 12 issues, $24. POSTMASTER: Send address changes to *COMPUTE!'s GAZETTE*, P.O. Box 10958, Des Moines, IA 50950. Second class application pending at Greensboro, NC 27403 and additional mailing offices. Entire contents copyright ©1985 by **COMPUTE!** Publications, Inc. All rights reserved. ISSN 0737-3716.

COMPUTE! Publications, Inc., One of the ABC Publishing Companies: ABC Publishing, President, Robert G. Burton; 1330 Avenue of the Americas; New York, New York 10019.

editor's notes

The brains of Commodore computers since day one—the 6502/10 chip powering the PET, CBM, SuperPET, VIC, 64, Plus/4, 16, and now the 128—is a doomed technology. This chip has had immense popularity. It was the microprocessor inside Apples and Ataris, too. But it's a twilight chip now.

Looming over the horizon, a much bigger and faster chip, the 68000, runs the new generation machines: the Apple Macintosh, Atari ST, and Commodore Amiga.

But as often happens, the end of an age produces its finest flower. Commodore's 128 is arguably the flower of the 6502 era. Bach's music, likewise, was nothing new. It was thoroughly baroque in style at a time when baroque was losing out to the emerging popularity of the classical style. But few would dispute the power and grandeur of Bach's compositions.

Just as Bach summarized and best exemplified the Baroque age in music, the 128 takes the 6502 chip to its limits. It is an economical computer, efficient and twice as fast as its predecessors, and yet also enormously flexible and well-designed. It's really several computers in one, and it offers just about everything a BASIC or machine language programmer could ask for.

When the 128 was first announced, it was clearly a dark horse. More than one pundit denounced it as an impossible machine to market. And consumers were lukewarm, too, following the notable silence that greeted the arrival of the Plus/4 and the Commodore 16. The market for the home computing dollar had grown severely restricted. Who would want to buy another eight-bit computer? And most importantly, the Amiga was attracting all the attention because it was the new age computer, a technological giant step forward.

The 128 wasn't radically different like the Amiga. It attempted to revive the tired CP/M operating system, and it seemed odd, a bit monstrous, with several configurations including, somehow, an entire Commodore 64 stuck inside. Would all that 64 software really run right? Would the new disk drive be faster and less prone to breakdown than older drives? Would an 80-column screen be readable?

These and other doubts that clouded the introduction of the 128 have all but disappeared in the face of surprising public and critical acceptance of the computer. It's selling very well. And, possibly more significant for its long-term success, people who use it love it.

It's multifaceted without becoming clumsy, and all the features are fully developed and thoughtfully integrated. And because it has got many software and hardware switches, you can arrange things the way *you* prefer. There are switches for a 40- or 80-column screen, warm reset, and dozens of escape sequences from the keyboard. You can quickly erase to the start of a line, to the end of the screen, to the end of a line, and so forth. This multiplicity of ways to erase is symbolic of the many levels of control the 128 offers. If you don't like the block cursor, switch it to an underline. If you don't like a flashing cursor, switch it to a steady state.

You can easily program the function keys to perform useful tasks at a single keypress. Programs can be made to run at double speed by switching to FAST mode. Windows can make the screen more attractive. Programs can be loaded and run with a single command. In fact, just turning on the computer can boot up a configuration for the system from a prepared boot disk. Disks with a variety of useful utilities—everything from unscratch to selective disk-copy—are included with the machine. Machine language programmers will appreciate the dozens of internal hooks, dozens of vectors, which make customization much easier. BASIC programmers will revel in the many new commands and easy to use disk instructions. Even SHIFT/RUN has been sensibly changed from cassette to disk addressing.

It's a computer construction set, and the owner has the pleasure of participating in the design of his personalized computer. That fact, the great amount of 100 percent compatible 64 software, and its speed account for the sudden emergence of the Commodore 128 as the low-end personal computer to watch in early 1986 and perhaps beyond.

Sources inside Commodore estimate that a quarter of a million 128s will be sold by the end of 1985, and this is responsible for putting Commodore in the black. By contrast, the Amiga has reportedly sold less than a tenth as many units. Both machines came out of the starting gate at roughly the same time, but the dark horse is leading the race at this point.

Richard Mansfield
Senior Editor

A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all the major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We didn't want a "close-out special" of an obsolete product that some manufacturer was dumping, so we limited our search to only those new printers that had the latest proven technology. We wanted to give our customers the **best** printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the SP-1000 from Seikosha, a division of Seiko (one of the foremost manufacturers in the world). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing at a respectable 100 characters per second, and with a very readable 12 (horizontal) by 9 (vertical) character matrix. This is a full bi-directional, logic seeking, true descender printer.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The SP-1000 has a print mode termed Near Letter Quality printing (NLQ mode). This is where the SP-1000 outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 24 (horizontal) by 18 (vertical). This equates to 41,472 addressable dots per square inch. Now we're talking ***quality*** printing. It looks like it was done on a typewriter. You can even print graphics using the standard graphics symbols built into your computer. The results are the best we've ever seen. The only other printers currently available having resolution this high go for hundreds more.

Features That Won't Quit

With the SP-1000 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 35 character styles including 13 double width and 3 reversed (white on black) styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy commands right from your keyboard. Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) or use *italics* to make the words stand out. Or, if you wish to be even more emphatic, underline the words. You can combine many of these modes and styles to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line. You have variable line spacing of 1 line per inch to infinity (no space at all) and 143 other software selectable settings in between. You can control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and ... VOILA! The letter now fits on one page.

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COMPUTE! Publications, Inc., publishes
COMPUTE! **COMPUTE! Books** ***COMPUTE!'s GAZETTE***

Corporate Office:
324 West Wendover Ave., Suite 200, Greensboro, NC 27408
Mailing Address:
Post Office Box 5406, Greensboro, NC 27403
Distribution Center
500-A Radar Road, Greensboro, NC 27419
Telephone: 919-275-9809
Office Hours: 8:30 AM to 4:30 PM Monday–Friday

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Subscription Rates

(12 Issue Year): US (one year) $24. Canada, Mexico and Foreign Surface Mail $30. Foreign Air Mail $65.

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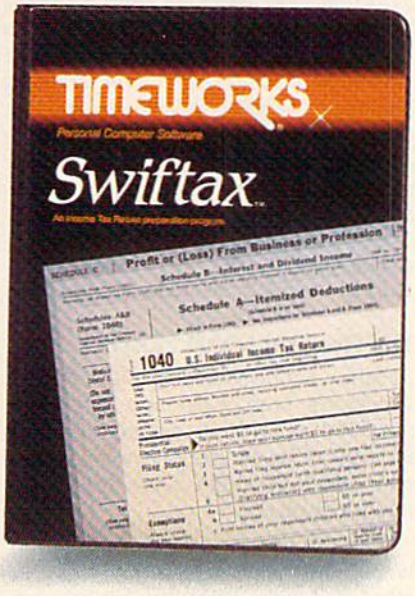

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feedback

Do you have a question or a problem? Have you discovered something that could help other Commodore users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403. We regret that due to the volume of mail received, we cannot respond individually to programming questions.

Commodore In Spanish

I work with a children's home in Costa Rica and would like to help the children get started using computers. I'd like to buy some Commodore machines if I can find any programs written for use by Spanish-speaking people.

F. Brooks Herman

Although Commodore does not produce any software for Spanish-speaking people, Sigma, an exclusive Commodore distributor based in Mexico City, has translated into Spanish many of the most popular Commodore software titles, and has developed other programs in Spanish. Also, one source at Commodore noted that other local distributors in Central and South America have translated or written Spanish software. A Sigma representative can supply more specific information about these local distributors. You may contact Sigma by phoning 52-5563-4144 (the first two digits—52—are Mexico's country code), or by writing Sigma, Holbein #157, CP03810, Mexico DF.

A Use for POS

It seems that the POS function gets little or no attention from books or magazines. Can you explain POS and include some program examples?

David L. Swain

The POS(X) function returns the current cursor position within the logical screen line. A logical screen line can be one or more physical *screen lines. On the 64, for example, a BASIC program line can contain up to 80 characters. The 80 characters would take up two screen lines, but would be considered only one logical line.*

The number after POS (in parentheses) is a dummy argument that's ignored by the function. You have to include a number, but its value doesn't matter. On the 64 and the VIC, the value returned by this function is the same as the number in location 211, the current cursor column.

On the 64, POS returns a value from 0 to 79. Values from 40 to 79 indicate the cursor is on the second physical line. On the VIC, POS gives you a value from 0 to 87. Since each logical line contains 22 characters on the VIC, the first physical line would have values from 0–21, the second from 22–43, and so on.

Admittedly, the POS function has few uses. You might find it helpful in a program that handles text. Suppose you've used a modem to download a text file and wanted to print the file to the screen. To prevent words from wrapping around and being split at the end of a line, you could have your program check the current cursor position using POS. If the value were greater than 30 or so, you would print a carriage return (CHR$(13)), like this: **IF POS(0)>30 THEN PRINT CHR$(13).**

The Dreaded LOAD ERROR

Recently, while saving a program to the Datassette, I ran out of tape. Now I cannot load it without getting a LOAD ERROR. Please suggest any and all methods that might work to retrieve this program.

Alan B. Callander

When a program is saved to tape, it's actually saved twice. When you load the program, the first copy is stored in memory and the second copy is used as a sort of checksum to compare the programs. If the first copy made it onto the tape, you may be able to recover it with the following actions:

1. Attempt to load the program from tape.

2. When it stops with the LOAD ERROR, enter ***POKE 45, PEEK(831): POKE 46, PEEK(832): CLR****.*

3. List it. If it seems to be intact, save it immediately to a new tape.

If these steps don't work, try moving the Datassette away from your monitor or television. Magnetism from these sources sometimes interferes with programs as they're loaded from tape. Tapes sometimes slip within the casing, and it may help to fast-forward and rewind the tape once or twice. Finally, the tape read/write head might be dirty. Many record stores have tape recorder cleaning/demagnetizing kits which will work just as well on a Datassette.

Listing Conventions

I typed in one of your programs and came across a line that looked like this:

```
PRINT "[<15 +>]"
```

What command is this?

Scott Collins

In the monthly section called "How to Type In Gazette Programs," you'll find our listing conventions. Each of the various graphics characters and control codes is listed in a certain way to make it easier to type in our programs.

The brackets, [< and >], mean you should hold down the Commodore key (at the lower left corner of the keyboard), while typing the character inside. So [<+>] would mean hold down the Commodore key and press the plus key. The number 15 means you should press it 15 times. Using [<15 +>] uses much less space than it would take to print [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>] [<+>].

Scorekeeping

I'm having trouble incrementing scores correctly in a game. If a player answers a question correctly, I use these lines:

```
56 IF A$="T" THEN 70
.
.
.
70 PRINT SC+10
```

Simon Yates

You're almost correct. But the variable SC must be incremented. If SC starts out as zero, PRINT SC+10 would print 10. But printing ten more than SC isn't enough—it doesn't change the value in SC. The score has not been updated. The next time line 70 executes, it would again show the value of 10. Change line 70 to:

```
70 SC=SC+10: PRINT SC
```

Now before the score is displayed, the value in SC is increased by ten (think of SC=SC+10 as "the new value of SC becomes the old value plus ten"). Of course,

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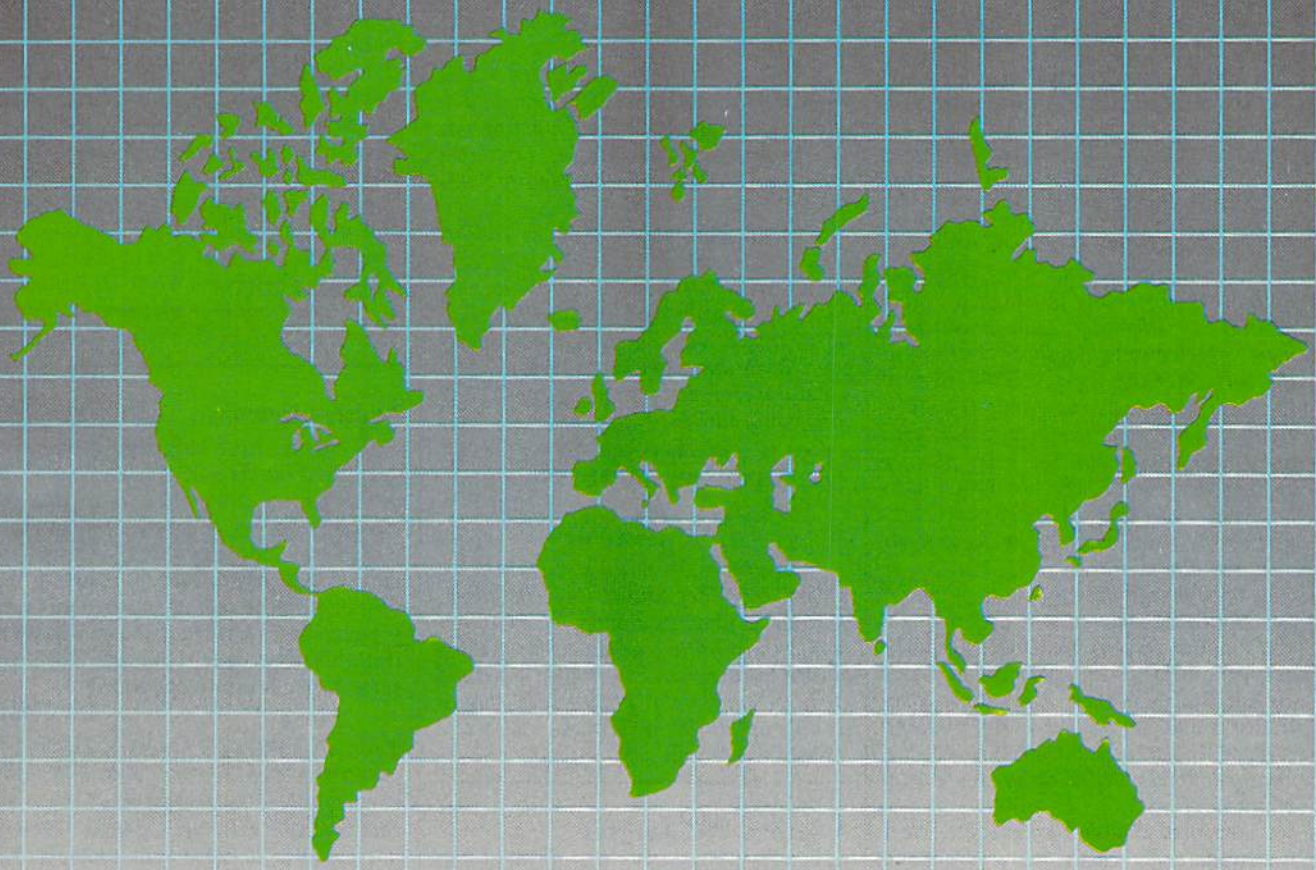

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you can increment by any value you choose, or decrease the score for incorrect guesses by changing the plus sign to a minus sign as part of another routine in your program.

Strange Radiation?

I have a Commodore 1702 color monitor. When I turn the monitor on and hold the back of my hand to the screen, the hairs on the back of my hand tingle and stand out straight. Is this radiation that would be harmful to a person? What causes this, and should I be concerned?

William E. Noice

No need to don your radiation suit—although eerie, what you're describing is an effect caused by static electricity, and is perfectly normal. It's no more dangerous than the tingly feeling you might get from rubbing a balloon on your head. Your monitor's electron guns shoot electrons at the surface of the glass, making areas of the screen light up, and giving it a static charge. When you touch or move your hand near the screen, the hairs pick up some of that charge. The individual hairs have the same charge, and like charges repel, so the hairs move as far as possible from the others.

This charge on the screen is also a powerful dust magnet, which is why TV and monitor screens get dirty so quickly. You can eliminate the problem by using an anti-static cleaner. Also, static electricity is only significant in dry weather. If there's moisture in the air, the electrical charges slowly drain away, instead of building up.

You may also encounter static electricity when you walk across a carpet and ground yourself by touching a metal object. Although the voltage may be high, the current is insignificant, so static electricity is harmless to you. *However, semiconductor materials, including most of your computer's circuitry, are especially sensitive to the high voltage of static electricity. A good spark between your finger and the joystick port is enough to zap sensitive components. That's why it's a good idea to touch a metal object to drain any static electricity you may have accumulated before you touch any computer equipment or a ROM cartridge.*

Speed Control

My older children like the program "Character Assassination" from the June 1985 issue. However, it moves too fast for my three year old and I haven't figured out how to slow down the falling characters. How would I do that?

Michael Schultz

That program was published with both a VIC and 64 version. You didn't specify which computer you own, but fortunately the modifications are the same for both programs.

To slow down the falling characters, you need to increase the value of the variable S in line 90. This variable is used in the delay loop at the beginning of line 210: **FOR TD=G TO S:NEXT TD.** *This loop starts at the FOR statement and ends at the NEXT. The value of G is always 1 in the program, while S can range from 1–28. Say S is equal to 28. The index variable TD would count from 1 (the value of G) to 28 (the value of S).*

This type of loop, where the NEXT immediately follows the FOR command, is often used to create a delay in a program. The program pauses while TD counts from G to S. The higher the value of S, the longer the delay.

So, to slow the speed of the characters, you need to increase the value of S. We could substitute a higher number for 28 in the equation for S in line 90. A similar approach would be to add a variable, say DE, to this equation which could be set at the beginning of the program. To do this, add a line 5:

```
5 DE=28: REM SET DE=100 OR
  GREATER FOR YOUNGSTERS
```

And change the equation in line 90 to read **S = DE − 3*VAL(B$).**

As written, the program would be set up for your older children. If your three-year-old is playing, change DE to 100 or higher in line 5 to suit his or her playing ability. Furthermore, if you like, you could even customize the program so that it would request the name of the player and adjust DE accordingly.

A Second VIC Joystick?

I recently bought *The VIC-20 Programmer's Reference Guide*. It says that a second joystick can be plugged into the user port. How is this done?

Pierre Rochefort

It's possible to add another joystick through the User Port (the 12-pin slot used for modems), but unfortunately there isn't the space to give complete details. The GAZETTE *published the information a couple of years ago in the April 1984 article "Tankmania: Adding a Second Joystick to the VIC." A few dozen April '84 back issues are still available, and we're forwarding information on how to order.*

Bar Coding For Programs

I'd like to use a light pen to record the programs in the GAZETTE. Running a light pen across each program line would end errors and be very fast. It would be the same way some stores record prices when you purchase something.

Daryl J. McKinnon

The Universal Price Code (UPC) stickers with the black and white bars are one form of bar coding. Theoretically, you could interface a 64 and a bar code reader like the grocery stores use, but a light pen would not be suitable for such a purpose. Bar code readers send and receive light. They also interpret what the bars mean, based on the patterns of light and dark on the label.

A light pen is a much more simple device. Light above a certain threshold triggers a light-sensitive phototransistor inside the light pen. So the pen sends one of two signals to a 64: Either it's receiving light or it's not. It can't distinguish shapes, and without a strong light source can't even make out patterns of light and dark on a printed page. You certainly couldn't use a light pen to read printed programs. A couple of years ago, a regulation bar code reader was announced for the 64, at a price over $100. Unfortunately, the company that planned to make it doesn't seem to be in business anymore.

Address Unknown

I have a machine language utility program that needs a SYS to activate it. To make a long story short, I've lost the starting address and now the program is useless. I do have the starting and ending addresses, but the starting address is not the one to activate this program. Is there a way for the computer to find the correct address or should I just scratch my favorite program?

Gil Cabral

Typical starting addresses are 49152 ($C000), 52224 ($CC00), 828, and 2061. You could try to guess the address, but that could be extremely tedious. There is no easy way to solve your problem. You can use the following program to print out the starting address of any PRG (program) file, but you indicate that you already know that number. Even if you don't know machine language, looking at the program with a disassembler could lead you to the right place. Just follow all JMPs and JSRs within the program. If the program clears the screen right away, look for statements that clear the screen, such as LDA #$93/JSR $FFD2.

```
10 INPUT "PROGRAM'S FILENAME";F$
20 OPEN 1,8,8,F$+",P,R": GET#1,A$:
   GET#1,B$
30 PRINT "STARTING ADDRESS:"
   ;ASC(A$ + CHR$(0)) + 256 * ASC(B$
   + CHR$(0))
40 CLOSE 1
```

Gazette Programs For The 128?

Do you plan to publish programs for the 128?

John C. Discasey

Yes. We began covering the 128 in the November issue with "Exploring 128 BASIC," which included several short

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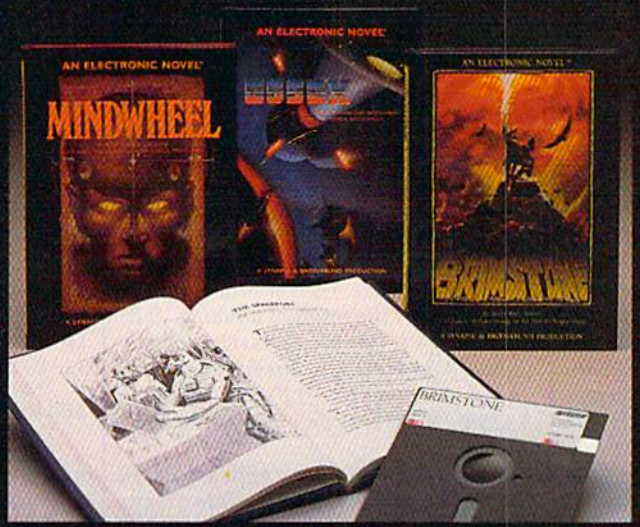

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programs. Last month, we featured "Programming Music and Sound on the 128," which also included several programs, and a 128 version of the program "REM Highlighter." Also beginning with that issue, we began publishing 128 programs—with an autobooting menu—on the GAZETTE DISK. *Elsewhere in this issue, you'll find "Disk Commands on the 128," and if you scan the righthand column in the Table of Contents, you'll notice several articles and programs which cover the 128 (in 128 mode). And for next month's issue, we've planned several other 128 items.*

Many of the programs we publish are from readers like yourself. The vast majority of submissions we've received in the past several months have been for the Commodore 64. Lately we've seen an increase in submissions for the 128, although the number received is still very small. Although we plan to increase our coverage of the 128—with tutorials and programs—we recognize that the majority of our current readership own Commodore 64s and that the 64 programs published work on the 128 in 64 mode.

Color Memory

I've got a program that picks a random position on the screen and POKEs a 102 there. The screen should fill up with checkerboard patterns, but the patterns only appear where characters are. But if I move the cursor around the screen, the checked characters are there. Why?

Greg Lado

Information about the screen display is stored in two places in memory: screen memory and color memory. Screen memory stores the codes representing characters, and color memory stores the color of each character. When you PRINT a character, the computer effectively POKEs the screen code of that character to screen memory and also POKEs the current cursor color to color memory. When you POKE a character to screen memory, you should also POKE the desired color into the corresponding location in color memory.

The problem is that you're not POKEing to color memory. On early model 64s, color memory is set to white when you clear the screen. Then Commodore changed the ROMs so that color memory is set to the background color. The current ROM version sets color memory to the cursor color. To find out which ROM version you have, type **PRINT PEEK (65408)**. *The first version has a 170 stored in this location, the next version 0, and the current version 3. When color memory is set to the background color, characters won't appear when you POKE to the screen. This indicates that you probably have version 2. You can see the characters when you move the cursor around the screen because the cursor temporarily changes the character color as it blinks.*

Here are the starting locations of screen and color memory for all 8-bit Commodores:

	Screen	Color
VIC (unexpanded)	*7680*	*38400*
VIC (3K expansion)	*7680*	*38400*
VIC (8K+ expansion)	*4096*	*37888*
64	*1024*	*55296*
Plus/4	*3072*	*2048*
16	*3072*	*2048*
128	*1024*	*55296*

What's Wrong With The 128?

I was talking to another 128 owner who said that it has a problem with simple subtraction:

```
PRINT 178.56-181.92
-3.35999997
```

My math says that's wrong. This represents a big problem in programs that require accuracy. Are there defective 128s? Have others experienced this problem? Maybe I should sell my Commodore and buy an Apple or some other brand.

Don A. Goshorn

This problem is not limited to Commodore computers. Most other personal computers will give the same result; in fact, if you subtract those two numbers on an Apple, the answer is the same. The answer is not to buy a more expensive computer. Limitations in our system of expressing numbers cause the kind of problem that you mention.

BASIC stores numbers in binary (base 2) notation. In general, it's just as good as any other format for storing numbers, but there are some oddities which show up if you try to convert nonintegers—numbers containing fractions—back and forth between different number bases.

Many numbers, indeed most of them, can't be expressed exactly in decimal (base 10) notation. Some of these, like the geometric constant π, are irrational numbers which can't be expressed exactly in any notation. A rational number (any number which can result from the division of two integers) can always be expressed in some base. For instance 3⅓ is a rational number, since it is the result of dividing 10 by 3. Although it can be represented exactly in base 3 (as 10.1), any attempt to write it in decimal (base 10), as 3.33 or 3.3333333333, will be incorrect by some amount.

The same problem appears when translating decimal numbers into binary. Many decimal fractions have no equivalent binary representation. Since Commodore BASIC stores a number in five bytes of memory, the error in the translation will be small, but occasionally noticeable. It is most often seen when an operation on two large numbers produces a small result. In the operation that you mention, the errors in representing 178.56 and 181.92 are small in comparison to the size of the numbers. But the result of the operation, −3.35999997, is much smaller than either of the operands. The error, while still not very large, appears bigger by comparison.

In some programs, you can increase precision by avoiding fractions. The operation (17856−18192)/100 will give a more accurate answer to the problem. But notice that the answer in your example is only 3/100,000,000 away from where it should be. If you were to plot the result on a screen, you wouldn't be able to see the error on the best display in the world.

Keeping On Schedule

I often need to work with dates and schedules in programs I design for my work. The programs have become cumbersome as they keep track of 30 or 31 days per month, and the extra day in a leap year. What advice can you give me with regards to manipulating month, day, and year? Adding specific amounts of time to a calendar date, for example, or notifying someone in six months that they're due for a procedure.

Dr. Donald Izzi

The calendar we use isn't very logical, from a programmer's point of view, but there's not much you can do to change it. Most of the time, the months alternate between 30 and 31 days, except for February's 28 days—29 in leap year—and July and August, where there are two 31-day months in a row (it seems that both Julius and Augustus Caesar wanted 31 days in their namesake months). Both December and January have 31 days, but we can ignore that if the program handles years as separate entities.

To simplify scheduling, try to avoid using months and dates. Instead of two variables (one for month, one for day of the month), give each date a number 1–365 during normal years, or 1–366 in leap years. For example, February 3 would be day number 34. The day number can be kept in a single variable. Here's a three-line subroutine you can incorporate into your program:

```
10 INPUT"DATE (MM,DD,YY)";MM,D
   D,YY:GOSUB500:PRINTDAY:GOTO
   10
500 AD=30:DF=-30:FORJ=1TOMM:DF
    =DF+AD+(J=3):AD=61-AD-(J=8
    ):NEXT
510 IF(YYAND3)AND(MM>2)THENDF=
    DF-1
520 DAY=DF+DD:RETURN
```

It's general enough to work on any Commodore computer. Whenever you need to find the day number, assign month, day, and year values to variables MM, DD, and YY and then GOSUB 500.

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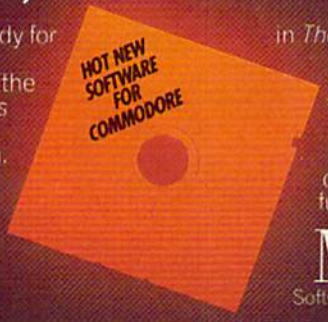

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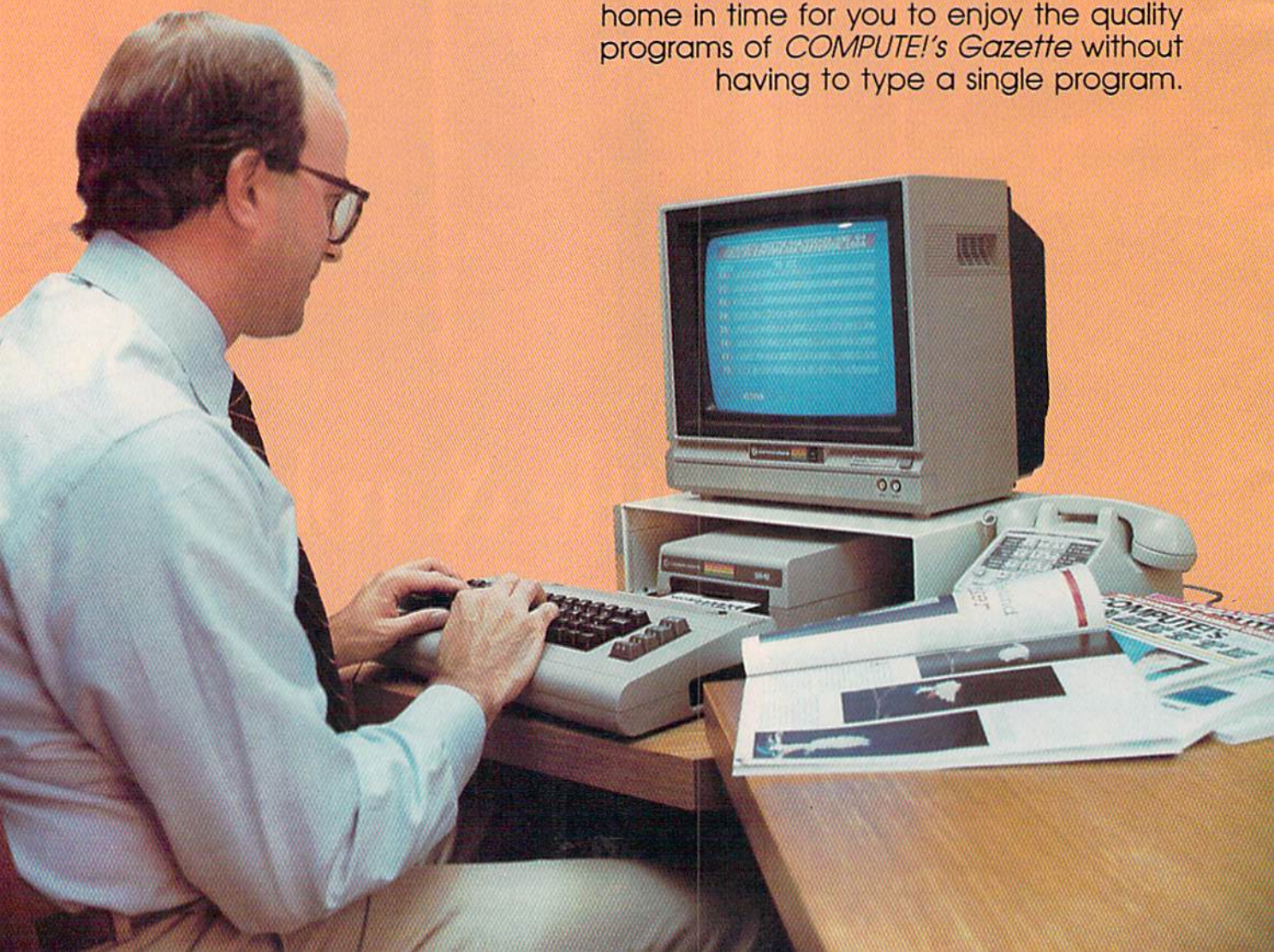

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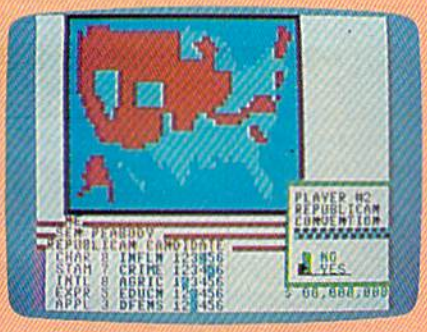

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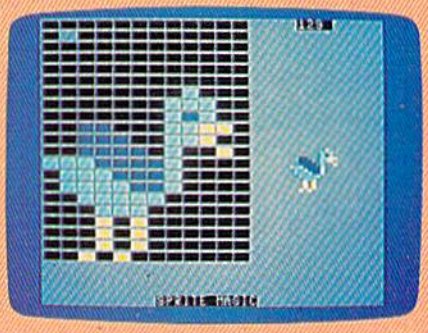

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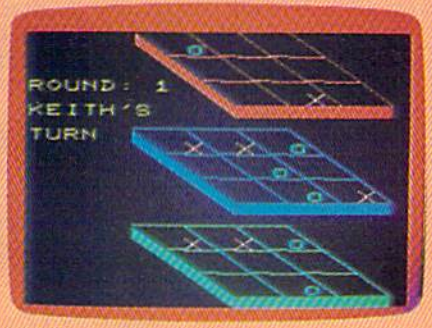

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35AD02

The day number is returned in the variable DAY. You can delete line 10, which is intended to illustrate how the subroutine works.

Once you have the day number, planning ahead is a matter of adding a certain number of days. Add seven to the current day number for next week, add 28 for four weeks (approximately a month), and so on. Six months would be 26 weeks (half a year), or 182 days.

Most people prefer to think in terms of month and day, so here's another routine that converts back again, from day number to month and date. Before you GOSUB 600, assign values to the variables DAY and YY. The year must be included because day 60 is February 29 in leap years, but March 1 in other years. Day numbers from 60 on will differ, depending on whether or not it's a leap year.

```
10 INPUT"DAY,YEAR";DAY,YY:GOSU
   B600:PRINTMM,DD,YY:GOTO10
600 AD=30:DF=-30:MM=0:YA=((YYA
    ND3)>0)-1
610 DG=DF+AD-(MM=2)*YA:AD=61-A
    D-(MM=7):IFDG<DAYTHENDF=DG
    :MM=MM+1:GOTO610
630 DD=DAY-DF:RETURN
```

The month and day are returned in the variables MM and DD. Again, line 10 provides a way of testing the routine and can be omitted from your program.

These two routines do not include any error checking. The first subroutine, for example, would accept March 35 as a valid input, treating it the same as April 4. Also, it doesn't handle dates before 1901 correctly, because the year 1900 was not a leap year.

Rules For Using Variables

I get an ILLEGAL QUANTITY error when I try to use DEC inside a program to convert a number from hexadecimal. But DEC works fine in direct mode (outside of a program). Any suggestions?

Mark Todd

Because you included a program listing, we were easily able to spot the error. But first a little background:

The BASICs in the 128, Plus/4, and 16 (but not the VIC or 64) contain the DEC and HEX$ functions. DEC converts a hex string to decimal, while HEX$ converts a number to a hexadecimal string. You must use strings, because hex numbers can contain the letters A–F. The following examples illustrate two acceptable forms of DEC:

```
PRINT DEC("30FF")
B$ = "30FF": PRINT DEC(B$)
```

A string literal should be enclosed in quotation marks. Note that both instances of 30FF are inside quotes. A string variable, on the other hand, should not be surrounded by quotation marks. The dollar sign is sufficient to mark that it's a string.

In your program, the line which caused the error looked like this:

```
PRINT DEC("N$")
```

The error occurred because you put the variable name inside quotes, in effect asking for the decimal value of the two characters "N" and "$". Remove the quotation marks from N$ and your program should work as you intended.

Extra Voices And Sprites?

I know it's possible to make more than eight sprites appear using an interrupt-driven routine. Is it possible to make more than three voices sound simultaneously using the same method?

Chris McNeil

It's not possible to have more than three voices sounding at the same time because the audio signal is a lot different from the video. The VIC-II chip is responsible for video output. It draws the screen line by line from top to bottom. It also takes care of adding sprite shapes when it gets to the lines they occupy. So sprites only affect the output of the VIC chip while part of the screen is being drawn. They're local phenomena. If you tell the video chip to put a sprite at the top of the screen, it does so and then forgets about that sprite until it's time to redraw the screen.

It takes time for a television tube to put the picture in place, and machine language is a lot faster. So a machine language program can fool the VIC-II chip into thinking that a single sprite is in more than one position, using a raster interrupt *technique. It's like setting an alarm: You ask the computer to let you know when the top part of the screen is being drawn. When the video chip gets to the top line, the interrupt is triggered and your program takes over. It puts the appropriate values into the sprite registers. You then set the alarm for the middle of the screen. When mid-screen is reached, the interrupt is triggered again and your ML routine puts entirely new values into the sprite registers. Although there are still only eight sprites in the VIC chip, some of them are drawn more than once, giving the illusion of more than eight sprites.*

The fundamental limitation to this technique is that only eight sprites can be in the process of being drawn at any one time. Two different versions of the same sprite can't overlap. Since sprites are relatively small, this isn't a big problem, but it gives us some idea of the problems that show up if we try to do an equivalent trick with the SID chip.

As long as the computer is turned on, the VIC chip is sending out a continuous signal. Sprite shapes are only a fraction of that signal. The SID chip, which makes sounds, can be turned on or off. And when one of the three SID voices is turned on, it is always in action. There are no in-between times when a voice is temporarily off. Accordingly, there is no way for the SID chip to simultaneously make another sound using that voice.

But in some songs, not all instruments play at the same time. It may be that the drummer never hits the snare drum while the bass drum is sounding. Or maybe a violin and a clarinet take turns playing phrases. In these situations, one SID voice can play the part of more than one instrument. For example, you would define the envelope of voice two to sound like a piano, play a few notes, change the envelope to a saxophone, play some more notes, return to a piano sound, and so on.

Escaping Errors With RESUME

I own a Commodore 16 and would like to know what RESUME does and how to use it.

Rob Ragona

RESUME is used to return to the main part of the program after an error-handling routine has been called. Normally when an error occurs in a BASIC program, the program is stopped and an error message is printed. Although this can be very useful when debugging a program, it can be very frustrating when a program crashes because of user input.

The TRAP statement traps errors by transferring execution of the program to a line specified whenever any BASIC error occurs. For example, ***TRAP 100*** *tells the computer go to line 100 after an error has happened. It's common to put the TRAP statement at the beginning of a program, before any errors have had a chance to show up. TRAP by itself, without a line number, turns off error trapping.*

The error handling routine can do many things when an error has been detected. The number of the error message is contained in the reserved variable ER, and the number of the line where the error occurred is in EL. Text for error messages is stored in the reserved array ERR$, so the full error message can be printed with the statement ***PRINT ERR$(ER) " IN" EL.***

Once the error handling routine is finished, program execution is returned to the main body of the program with the RESUME command. This command can be used in three ways:

RESUME	*returns the program to the line where the error occurred*
RESUME ***line number***	*returns the program to the line specified*
RESUME NEXT	*returns the program to the line immediately after the line where the error occurred*

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The following program uses the error trapping commands to screen out bad user input.

```
10 TRAP 100
20 PRINT "ENTER TWO NUMBERS TO
   BE DIVIDED":INPUT A,B:C=A/B
30 PRINT "THE FIRST NUMBER
   DIVIDED BY THE SECOND IS";C
40 END
100 IF ER=20 THEN PRINT "I
   CANNOT DIVIDE BY ZERO":
   RESUME: REM ER=20 MEANS
   DIVISION BY ZERO
110 PRINT ERR$(ER)" IN LINE"EL :
   REM IN CASE OF OTHER ERRORS
```

You Can't Write To ROM

I was trying to get into ROM and stumbled across the undocumented command SYSTEM. Sometimes it makes the screen act as though I pressed RUN/STOP–RESTORE. And sometimes it locks up the computer. Could you explain what this word means? Also, could you tell me how to change ROM? I'd like to have the computer print "HELLO. I'M READY." when I turn it on.

George McNinch

SYSTEM is not a new command. When you type the word SYSTEM, the computer finds the command SYS in the first part of the word and treats the remainder of the word (TEM) as a variable. SYS transfers control to a machine language routine; BASIC is temporarily disabled while a SYS is in effect. Since you probably have not defined the variable TEM, a SYS is performed to address 0. The contents of this section of memory changes frequently, so the results are unpredictable.

Try typing this: ***TEM = 64738: SYSTEM****. In this case, the variable TEM has been defined, so the computer is sent to location 64738 (the cold start routine on the 64).*

The answer to your second question is no, the computer's ROM cannot be changed directly. ROM stands for read-only memory. You can read it, but not write to it. It's possible to change the way BASIC works, however. The ROM cannot be changed, but you can copy the ROM into the RAM and tell the computer to fetch its information from RAM instead of ROM. Bit 0 of location 1 determines whether ROM or RAM is used at locations 40960–49151 (where BASIC is located).

The following program copies ROM into RAM (line 10), selects RAM at location 40960 (line 20) and changes RAM to alter the READY message (line 30). The word READY has been changed to HOWDY.

```
10 FOR A=40960 TO 49151: POKE
   A,PEEK(A): NEXT
20 POKE 1,PEEK(1) AND 254
30 N$="HOWDY": FOR A=1 TO
   LEN(N$): POKE 41847+A,ASC
   (MID$(N$,A,1)): NEXT
```

Unfortunately, as soon as the computer is turned off, the memory is cleared. In order to have a message come up as soon as the computer is turned on, you must use an EPROM (erasable programmable ROM). Whenever the computer is turned on, the cartridge port is checked to see if a cartridge is inserted. If one is present, then control of the computer is turned over to the cartridge.

An EPROM is a cartridge that can be programmed with a special tool called an EPROM burner. This device takes a program in memory and burns it into a cartridge. The cartridge can be programmed to do anything, including customizing your BASIC messages. As soon as the computer is turned on, the program in the cartridge is executed.

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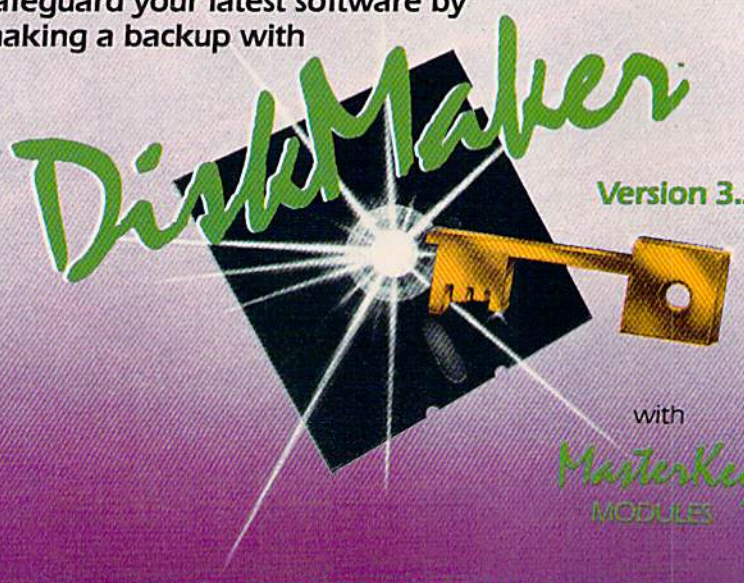

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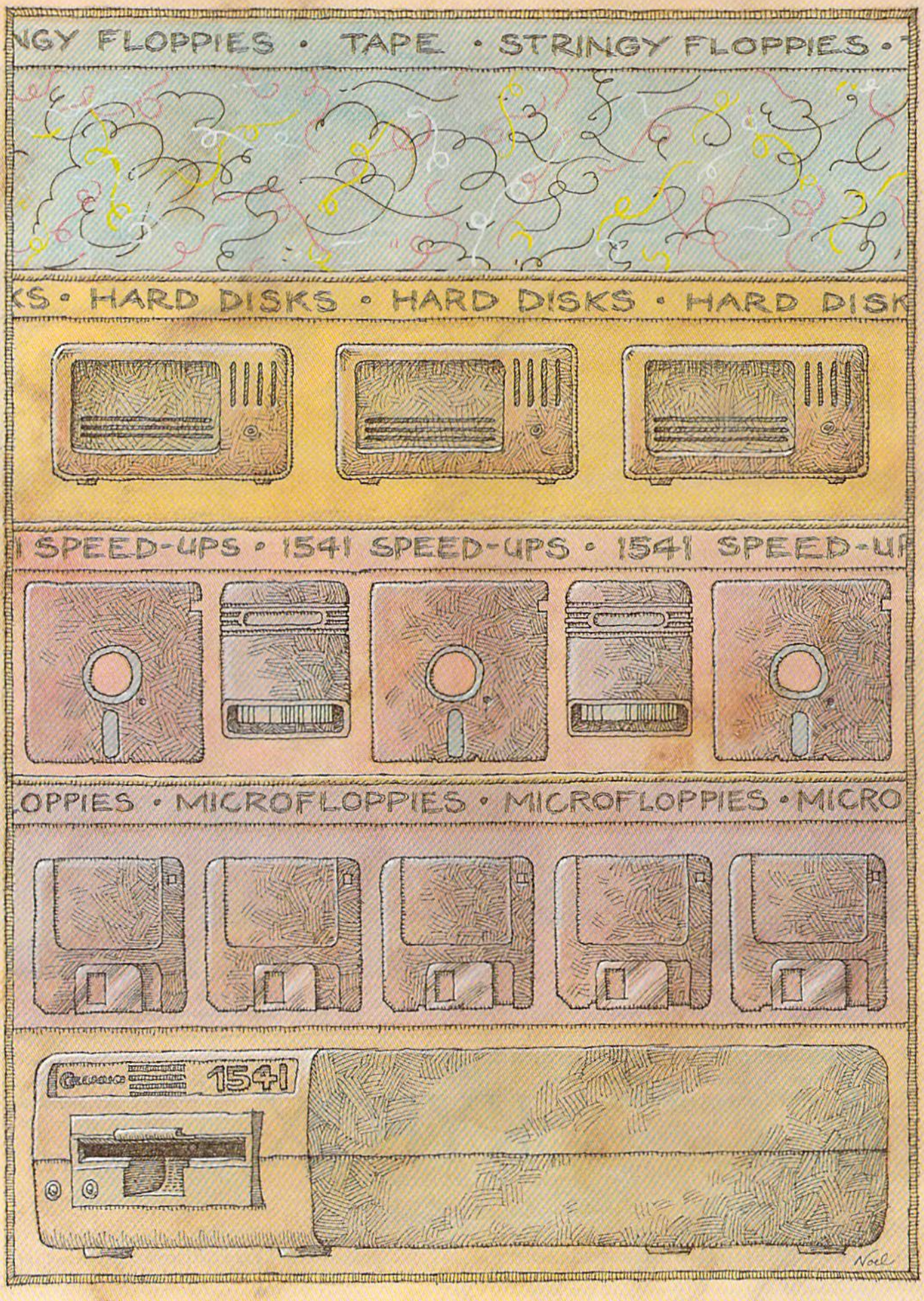
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BEYOND THE 1541

Mass Storage For The 64 And 128

Selby Bateman, Features Editor

A 3.5-inch microdisk drive for the 64? A hard disk storage system for the 128? The continuing evolution of personal computers is causing major shifts in the kinds of data storage devices being used. There are signs that even the familiar 5-1/4-inch floppy disk may eventually go the way of punch cards and paper tape storage methods. Here's a look at what's headed your way in the Commodore market.

Consider the 1541 disk drive: It's been called a "toy," a "lumbering hippo," and "the albatross of the Commodore 64." Business users impatiently deride its slow operating speed. Alternative devices and software speedup schemes have been offered by other manufacturers. And even defenders of the 1541 have been known to drum their fingers waiting for it to load data at a relatively slow 512 bytes per second.

Yet despite the insults hurled at the 1541, one Commodore source estimates that as many as three-quarters of the five million 64s and VIC-20s sold worldwide are used with 1541s (or the earlier 1540 drives). The slow but relatively inexpensive 1541 became another salvo in the continuing battle to bring down prices and spur consumer sales of computers.

It's difficult to believe that the 64 and the 1541 are almost four years old. At the Consumer Electronics Show (CES) in January 1982, Commodore introduced its new 64K computer at a suggested retail of $595, a breakthrough in price and power. Commodore also introduced a companion for the 64: the 1541 drive, a direct descendant of earlier drives used with the VIC-20 and PET computers.

When first released, the 1541 sold for almost $600. But prices dropped swiftly, just as they did for the 64 itself. Soon, a 1541 could be bought for $399, then $299, and $250. Today, a new 1541 can be purchased from some vendors for as little as $149, and used 1541s frequently are available for $99.

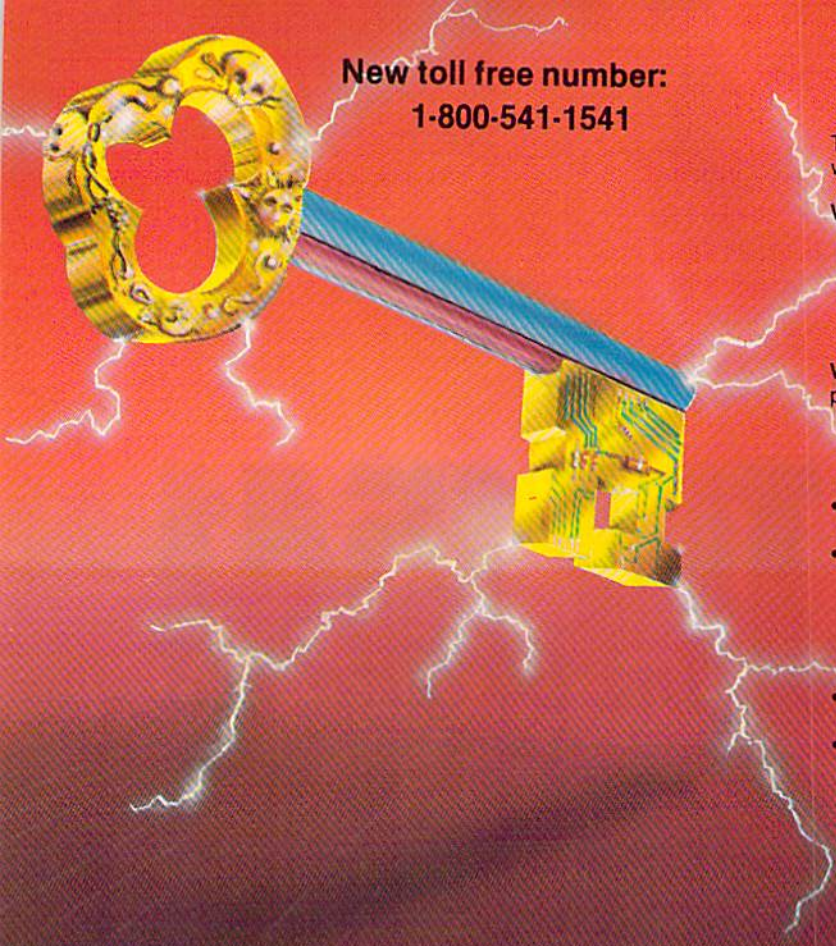
But for many 64 users, the 1541 was not their first storage device. Commodore's Datassette tape recorder, a digital cousin of the common audio cassette tape recorder, was offered at even less expense.

Why tape recorders? The emerging microcomputer industry borrowed ideas from mainframe computer systems, and tape storage proved to be a natural—inexpensive and dependable. The problem with tape storage is its speed.

A tape recorder is a *sequential* access device. That is, the magnetic information is read sequentially from the tape as it passes in front of a stationary read/write head. To get to a particular program on the tape, several other programs may have to slide by the tape head before it reaches the one you want.

On the other hand, a disk drive is a *random* access device. The read/write head moves across a spinning disk, much like the stylus of a record player moves across the face of an album. The result is a much more efficient means of data access than a cassette tape. Although the 1541 is slower than other computers' disk drives, it is much faster than a Datassette.

Despite its slowness, the Datassette and some third-party cassette recorders introduced



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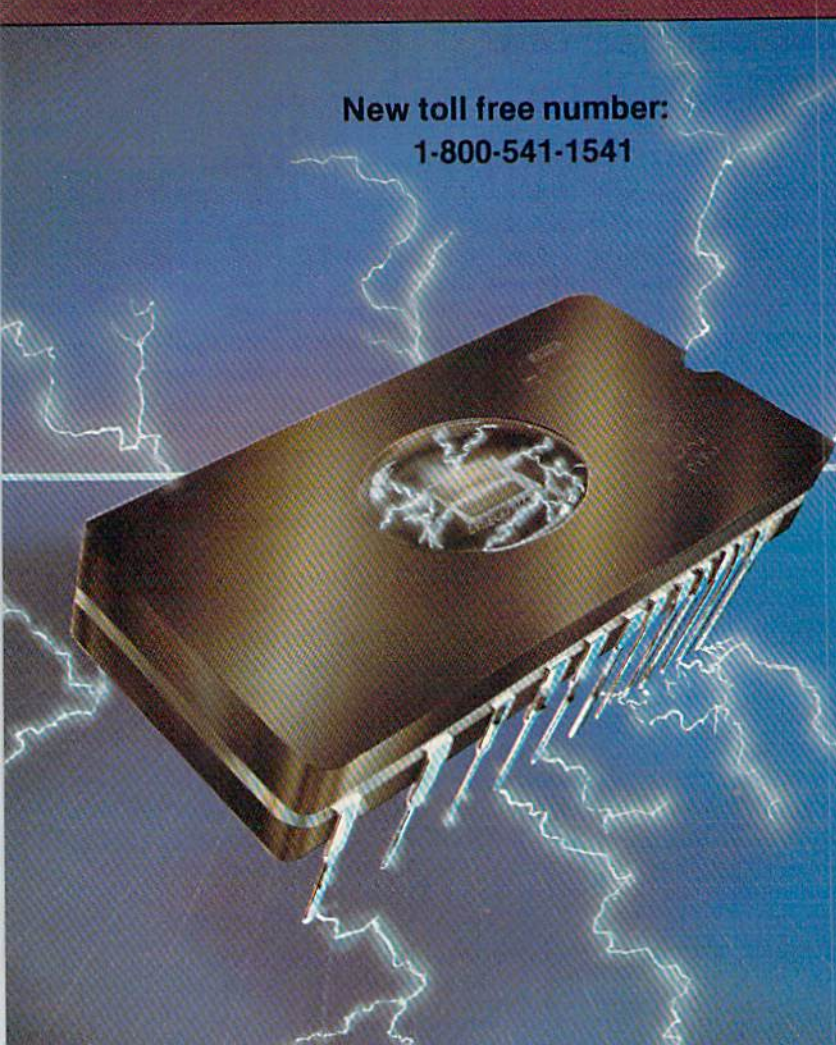

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The chart below compares ACTUAL MEASURED loading times.

PROGRAM	STAR DOS	REGULAR LOAD	MACH 5	FAST LOAD	MAGNUM LOAD
Pinstop II (EPYX)	?	144 sec	43 sec	41 sec	31 sec
Music Shop (BRODERBUND)	?	105 sec	105 sec*	105 sec*	21 sec
Hitchhiker's Guide to the Galaxy (INFOCOM)	?	70 sec	70 sec*	**	68 sec*
On-field Football (GAMESTAR)	?	159 sec	66 sec	63 sec	56 sec
EASY FINANCE I (COMMODORE)	?	58 sec	13 sec	13 sec	11 sec

* = Will not fast load — defaulted back to regular load.
** = *Failed to load at all.*

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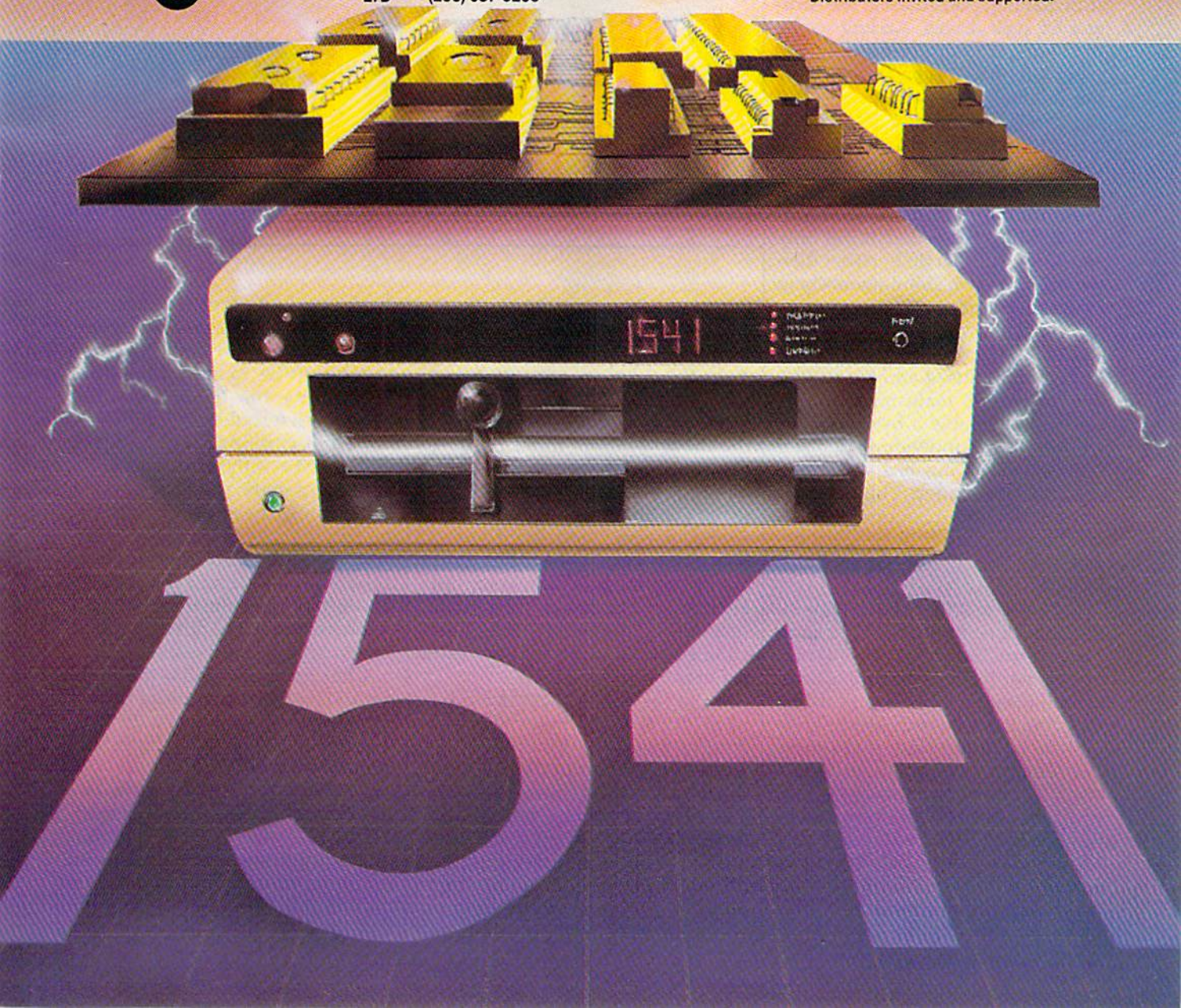


thousands of computer users to data storage in the early years of the Commodore 64 and the VIC-20. Commercial software was usually offered in both tape and disk format (and frequently in plug-in ROM cartridges). But during the past year and a half, virtually all commercial software vendors have forsaken tape versions of 64 software. The thousands of commercial programs available for the 64 are almost all on disk. And at Commodore, stacks of Datassettes sit boxed and ready with no place to go. Technology has rendered them obsolete.

A computer as inexpensive as the 64 had to have a disk drive in the same price range. To cut costs, Commodore equipped the VIC and 64 drives with serial data transmission ports, much slower than the IEEE parallel ports used in the earlier PET disk drives. Adding to the problem, Commodore engineers reportedly had to slow very slightly the original data transfer speed of the 1540 (designed for the VIC) in order to make the new 1541 drive compatible with the 64—an engineering concession to marketing plans for the computers.

A serial connection moves only one bit of data at a time, rather than multiple bits sent simultaneously in a parallel connection. Further slowing serial transfer between the 64 and the 1541 is the fact that the VIC and 64 (and Plus/4 and 16) require the computer's main microprocessor to disassemble a byte of information into its individual bits, add several controlling bits, and then send the information. This takes extra time for the microprocessor. A special-purpose hardware serial device could accomplish this much faster.

That's exactly what Commodore has done in the new 128 computer and its 1571 disk drive. Special hardware takes care of most communication handling (the first CIA chip takes on extra work), freeing the microprocessor from these chores and thus increasing the speed of transfer. Commodore calls this *serial fast mode* as opposed to the 64/1541 *slow mode*. As 1571 owners know, their disk drives can actually work at different speeds, depending on whether it's in 1571 mode for the 128, 1541 mode for the 64 or 128, or CP/M mode.

The BCD/5.25 disk drive from Blue Chip Electronics is one of several Commodore-compatible drives for the 64 that offer faster speeds than Commodore's 1541 drive.

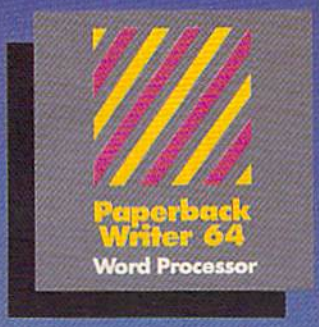
A number of companies have produced Commodore-compatible disk drives in an attempt to improve on the 1541. The BCD-5.25 drive from Blue Chip Electronics, the Indus GT from Indus Systems, the MSD SD-1 (single drive) and SD-2 (dual drives) from MSD Systems, the Enhancer 2000 from The Comtel Group, and the Clone II disk drive from HBH Sales Corp. are among the best known of these alternative disk drives. As a group, they offer considerably faster operating speeds and a variety of extra features.

But, as some GAZETTE readers have discovered, these "Commodore compatible" drives aren't always "1541 compatible," a big difference when it comes to loading and using some commercial software. There are even a few commercial programs that won't load on the 1571 in 1541 mode. Compatibility problems usually crop up when a commercial software producer has copy-protected disks in such a way that the program checks for the ROM (Read-Only Memory) routines to be found in the 1541 drive. Since the other disk drive makers are forbidden by copyright law from copying Commodore's 1541 ROM exactly, they have slight differences in the way they operate. Sometimes, these differences are enough to make the software fail to load properly. Although most of the drive manufacturers do extensive testing of commercial software before releasing the drive, new protection schemes arrive every day.

But for many users, the problem of commercial software incompatibility is not sufficient to keep them from using these faster and often more reliable drives.

Another way around the 1541's weaknesses has been offered by several software manufacturers: cartridge- or disk-based programs which speed up the data transfer rate between the computer and the disk drive. Among these

Solutions!



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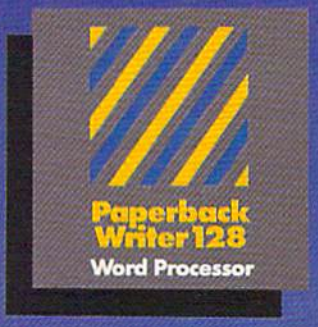

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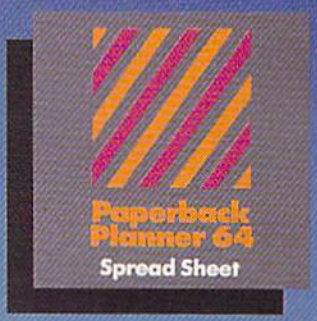

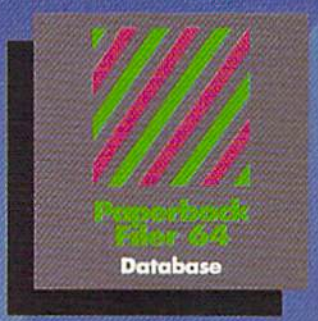

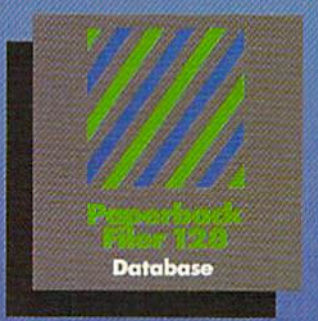

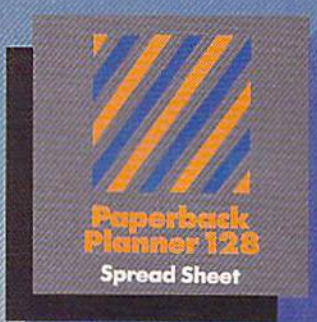

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are the *Fast Load* cartridge from Epyx, the *MACH-5* cartridge and disk from Access, the *1541 Flash!* hardware adapter from Skyles, and the *Kwik-Load!* disk from DataMost. The GAZETTE has also offered its own quick-load programs for the 64, "TurboTape" and "TurboDisk" in the July 1985 issue.

A less common approach to storage devices for the 64 has been taken by Entrepo of Sunnyvale, California, maker of the Quick Data Drive (QDD). The QDD is a *stringy floppy* system, a high-speed cassette tape in a small wafer. As with a cassette tape player, like the Datassette, the QDD is a sequential access storage device. But the tape is a continuous loop; it doesn't have a beginning and end, so it doesn't have to be rewound to the beginning, it just fast-forwards until the program is found. Programs can load considerably faster than a regular cassette tape—and even the 1541—because data is transferred at a faster rate. To the computer, the QDD acts more like a disk drive than a tape drive.

Although Entrepo has been transferring a number of third-party commercial software programs on wafers for use with the QDD, software vendors aren't likely to support this format unless a large enough installed base of QDDs makes it worthwhile. Still, at a suggested retail price of $84.95, the QDD offers an innovative, relatively inexpensive data storage system for Commodore owners. (For more information on the QDD, see the November 1985 "Horizons" column.)

Another Commodore drive, the SFD-1001, is actually an older model PET disk drive that can be used with your 64 or 128 (in 64 mode). Priced at under $400, the SFD-1001 is a one-megabyte double-sided, double-density parallel drive that requires an IEEE parallel interface and a Commodore PET computer cable to work with your 64. These drives are no longer in production, and were first built by Commodore for the PET computers, so they're not meant to run 64 commercial software made for the 1541. However, Progressive Peripherals and Software has acquired the marketing rights to the remaining stocks of these drives.

One of the fastest growing trends in the data storage area is the move toward 3.5-inch microfloppy disks, adopted for Apple's Macintosh and for the new 520 ST from Atari and the Amiga from Commodore. Encased in rigid plastic, these disks are more rugged, faster, and pack more data per disk (usually about 400K single-sided, 800K double-sided) than most standard 5-1/4-inch disks (approximately 174K on a 1541 unformatted disk). Industry rumors are that IBM may soon adopt the 3.5-inch standard for one or more of its new computers, which would give this format an even greater boost. During 1985, Apple Computer announced a 3.5-inch drive to be used with its Apple IIe and IIc computers, as well.

> "It would take 60 single-sided 1541 disks to hold the information stored on one 10-megabyte hard disk."

Will Commodore also offer a 3.5-inch disk drive for use with the 64 and/or 128? So far, company officials have been against the idea, concentrating their efforts on getting the new 128 and Amiga computers out. But, from a technical standpoint, Commodore could market a 3.5-inch drive for the 64 or 128 tomorrow, say several sources.

At last summer's CES show in Chicago, Commodore announced to the press its intention to market an LCD laptop portable computer, which could be used with an external 3.5-inch drive. Although the laptop portable has been shelved for the time being, Commodore is said to be looking at the 3.5-inch drive for use with the 64 and/or 128. With the 64's immense base of 5-1/4-inch software, why bother with 3.5-inch media? Certainly, software companies would have to see a potential for a large installed base of 3.5-inch drives before converting their products to that format. But, as the 3.5-inch trend continues to gather speed, some developers feel there may be an emerging market for that type of storage device. Apple's decision to offer a 3.5-inch disk drive for the Apple II computers, which also have a huge base of 5-1/4-inch software, may help Commodore decide in favor of releasing the drive.

Commodore is also holding off on the release of the previously announced 1572 dual disk drive for the 128. No price had been announced, but the 1572 was to feature two 5-1/4-inch drives for 64, 128, or CP/M modes. Each of the drives would read double-sided, single-density disks with up to 340K (formatted) memory in 128 mode, and double-sided, double-density disks with up to 410K (formatted) memory in CP/M mode.

One company, Blue Chip Electronics, plans to make and sell a 3.5-inch drive for the Commodore 64 as early as the first quarter of 1986. Called the BCD/3.5, the drive will work with the 64 and with the 128 in 64 mode, according to John Rossi, president of Blue Chip. To be priced at under $100, the BCD/3.5 is supposed to carry 250K per disk and let you copy programs from the 1541 5-1/4-inch format to 3.5-inch format. Prices for 3.5-inch disks and drives will be dropping across the computer industry in 1986, says Rossi, especially if IBM adopts such a drive, as expected.

Blue Chip is also planning an alternative to the 128's 1571 drive. Although still in prototype stage at this writing, the unit is tentatively called the BCD/128, will sell for under $200, and will operate in all three 128 modes—64, 128, and CP/M.

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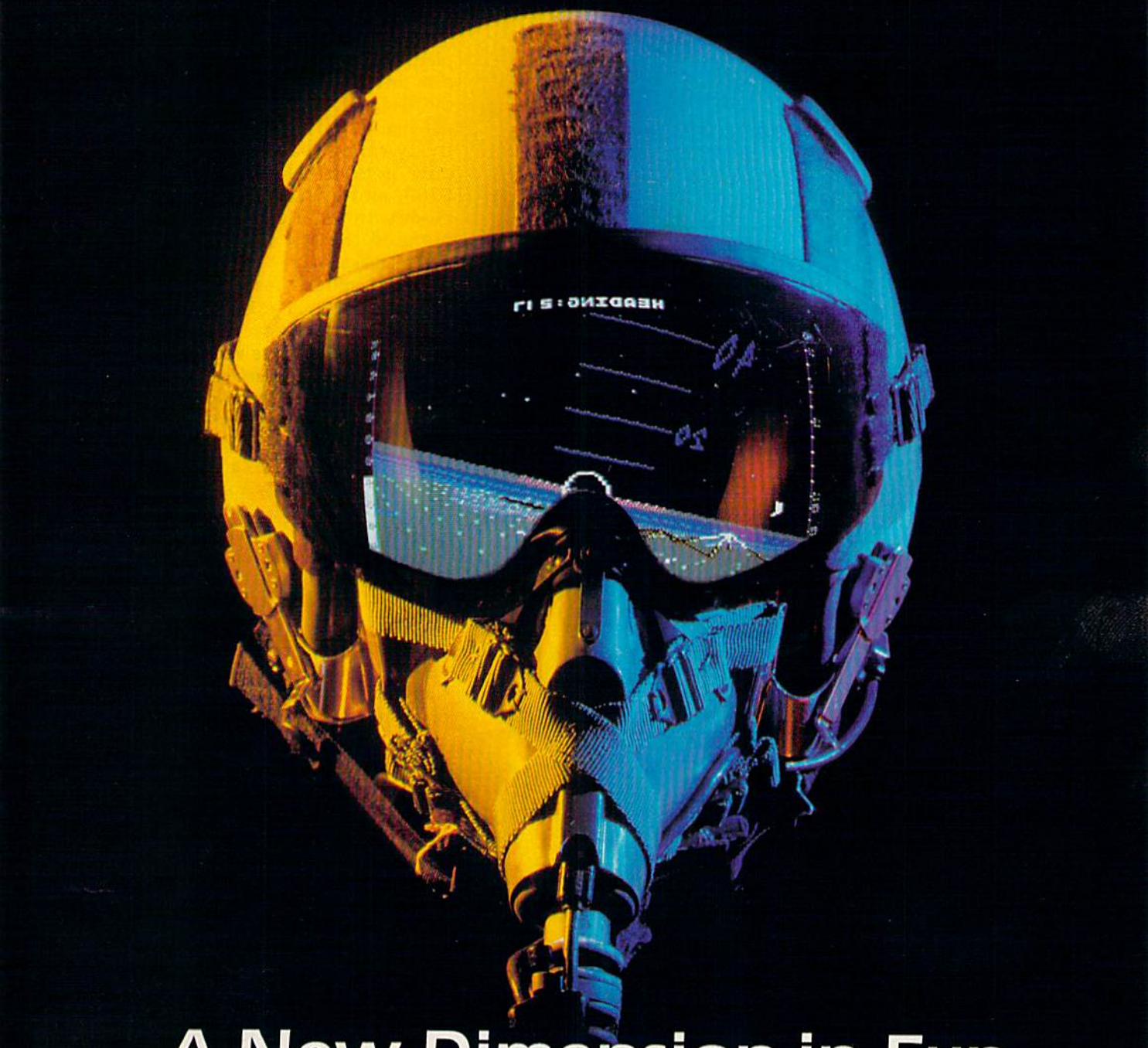

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Another company planning a replacement for the 1571 is World Disk Drives of Laguna Hills, California. The company originally planned to market a 64-compatible disk drive, the Mirage, but shelved the idea and switched to the potential market for 128 drives. Tentatively called the CXT-1281, the drive is to be sold for just under $300, and operates in all three modes. In addition, the drive is planned to read single-density CP/M disks (such as those on Osborne computers) as well as the double-density CP/M disks which the 1571 drive reads. The unit is also expected to come with a built-in parallel printer interface that features full Commodore graphics and conversion from Commodore ASCII to standard ASCII.

To be marketed as a part of the CXT-1281 (possibly for an extra charge) is a ROM configuration program which will let the drive automatically check for what kind of CP/M disk is installed (Kaypro, Osborne, etc.). Once classified, the drive will configure the keyboard to emulate the appropriate computer's keyboard commands. The drive should be available by the time you read this.

For the maximum in data storage, personal computers need the capacities of a hard disk, which can hold 10, 20, even 100 megabytes (MB) of information. To put things in perspective, it would take 60 single-sided 1541 disks (or 30 double-sided 1571 disks) to hold the information stored on one 10-MB hard disk.

Commodore was scheduled to announce a hard disk for the 64 at last summer's CES show, but held back at the last minute. At this time, according to one Commodore source, there are no plans to market a hard disk for either the 64 or the 128. Again, according to several sources, marketing considerations won out over technical capability.

Two companies that do sell hard disks for the Commodore 64 also plan to sell hard disks for the 128 in all three modes.

Fiscal Information, Inc., has released an improved version of its Lt. Kernel hard disk drive for the 64 (and 128 in 64 mode). Up to 16 64s can be linked with the Lt. Kernel,

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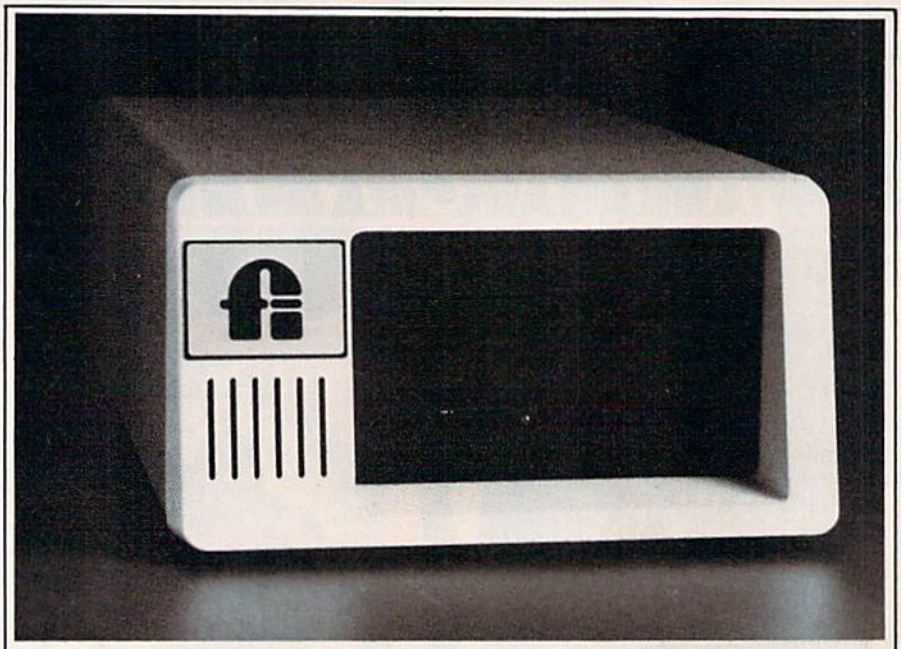

Fiscal Information's $1595 Lt. Kernel is a 10-megabyte hard disk drive for the Commodore 64 and 128 computers.

which comes in 10MB or 20MB versions and is 43 times faster than the 1541. Priced at $1595 for the 10MB single unit, the new Lt. Kernel carries its own self-contained DOS (disk operating system) and uses none of the 64's RAM. The unit connects to the computer's cartridge port and transparently implements all of the 1541's DOS functions.

Hard disks have been used with 64s in a variety of areas, primarily for bulletin boards, retail stores, police department databases, and software development houses, says Lloyd Sponenburgh, director of hardware development for Fiscal Information, Inc. Although the present Lt. Kernel doesn't support the 128 in CP/M and 128 modes, the company hopes to have it working in all three modes by early January, Sponenburgh says.

Computer Specialties, Inc. (CSI) has a hard disk for the Commodore 64, the CSI 10C hard disk drive system, a 10MB drive which also sells for $1595. The CSI 10C works in both 64 and 128 modes, can be linked to as many as eight computers, and has an intelligent backup function which lets the hard drive know what kind of backup drive is attached.

Although hard disk drives have generally been too expensive for many home users, that's changing. For example, a new hard drive for the Atari 520 ST computer should be available for around $699 by the time you read this. As technology changes and prices drop, it's possible to see hard disks for the 64 and/or 128 in that price range during 1986.

The power and range of data storage devices are changing as personal computers become more sophisticated and new technologies emerge. Among the advanced storage options already in use with some computers are hard disk drives with removable cartridges, and the Bernoulli Box, a flexible-disk system with the power of a hard drive that's based on a novel air-cushion technology. On the horizon is a growing array of optical disk media that use low-power lasers to read digital information from compact discs. Many computer experts agree that this laser-driven technology will one day supercede the magnetic media we use today.

For Commodore owners, it's not time to think about throwing away all the 5-1/4-inch disks. But with data storage formats such as the 3.5-inch disk and hard drives moving into the personal computer marketplace, the future of the 5-1/4-inch floppy disk may be a short one.

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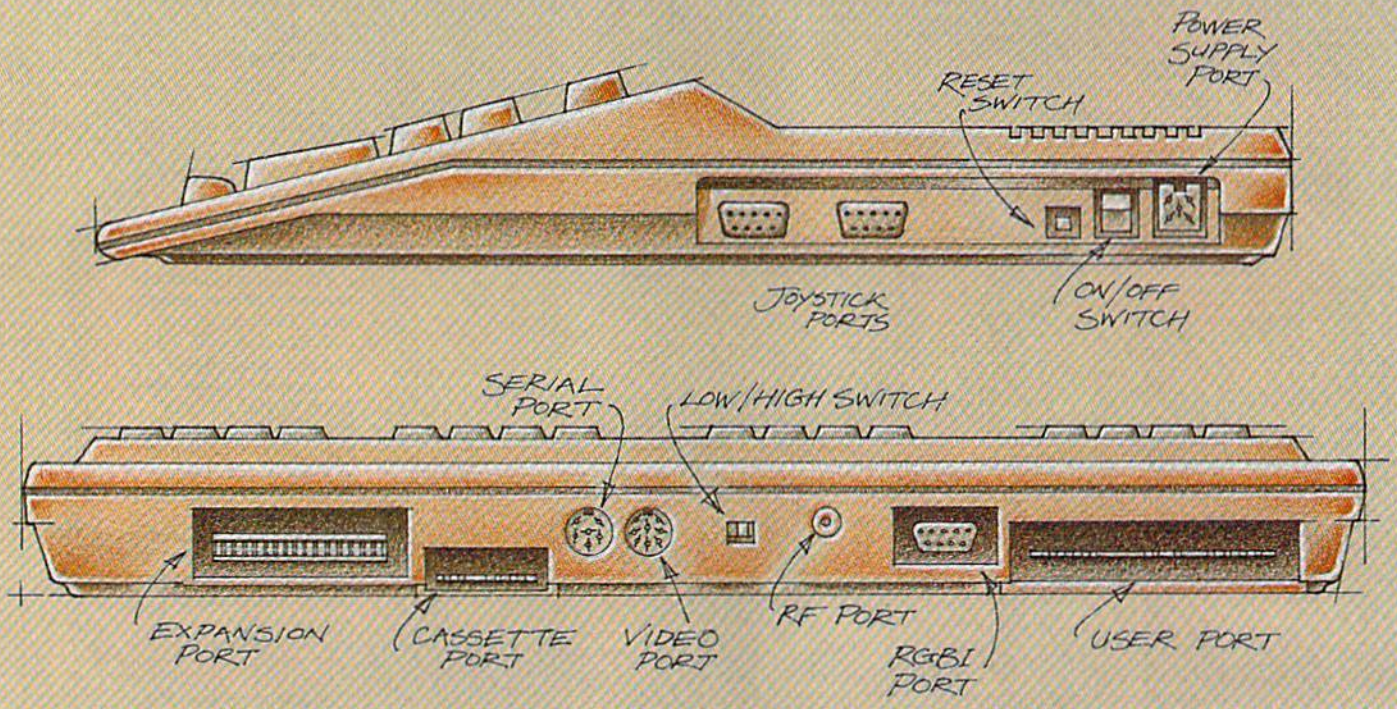
Using Commodore 64 Peripherals On The 128



The Well-Connected Computer

Kathy Yakal,
Assistant Features Editor

If you're considering buying a 128 and have already spent a lot of money on peripherals for your Commodore 64, you may be concerned about compatibility. Will your old printer and monitor and disk drive suffice? For most applications, the answer is yes.

Peripheral compatibility between the Commodore 64 and 128 is not as simple an issue as it was between the VIC-20 and 64, though, in most cases, the peripherals are interchangeable. The only real problems arise if you want to take full advantage of the 128's special features, like its 80-column screen and CP/M capability.

One of Commodore's prime objectives in designing the 128 was "to maintain hardware and software compatibility with the 64," according to preliminary technical documentation. With millions of active 64 users out there, and hundreds of popular software packages and peripherals in place, that certainly makes sense.

With one exception, the ports and switches on the 128 are identical to those found on the 64. Starting at the lower right side of the 128, let's move around counterclockwise and have a look at which peripherals work with the 128.

Joystick Ports

Control ports 1 and 2, as they're labeled on the 128, read the signals sent to the computer by either switches or potentiometers (a potentiometer is like the dimmer switch in an overhead dining room light fixture). These signals are sent out from joysticks, paddles, trackballs, graphics tablets, light pens, and Commodore's new mouse, which is like an upside-down trackball.

There was a bit of an outcry when the Plus/4 and 16 were released because the machines' joystick ports were not compatible with existing joysticks. But any of the above that you might have purchased for your VIC or 64 will work on the 128.

On/Off Switch

This has the same function as the 64, to turn on the computer. There's also a reset switch (not available on the 64) that works basically the same as the on/off switch.

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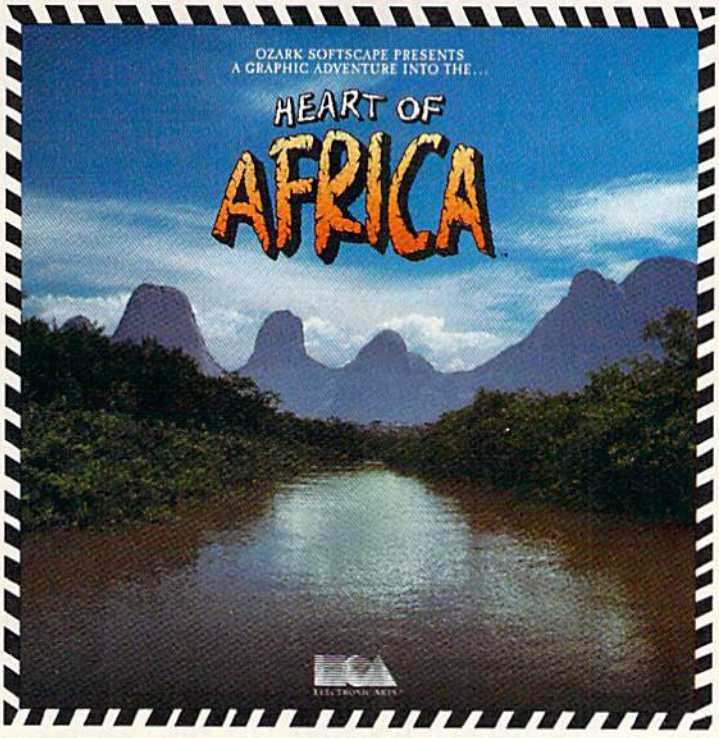

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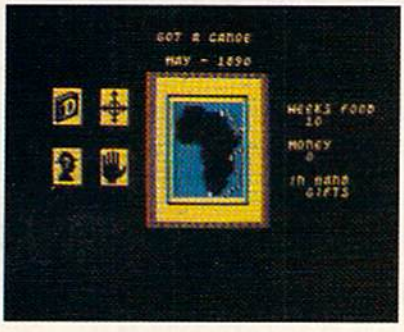

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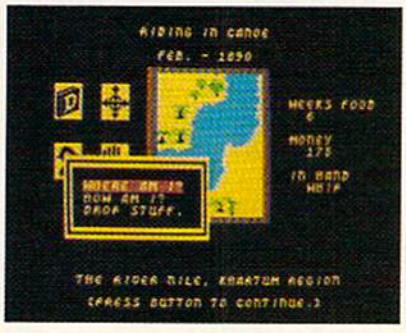

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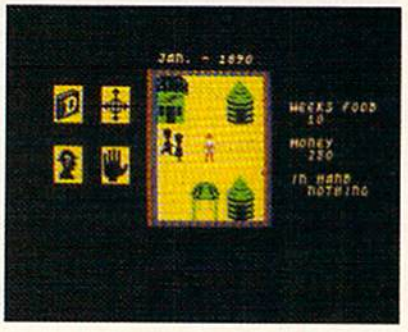

Decipher Native Clues

Local myths will help, if you can get the natives to talk. Enter their huts. Learn their customs. Pass out some bribes. The chief might tell you, "Look where the sun rises over the Childless Waters." Now try to figure it out.

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Power Supply Port

You can't use the original two-pin VIC-20 power supply on a Commodore 64 (although the newer VICs use the same seven-pin plug as the 64), and you can't use a 64 power supply on a 128 because of their different voltage and current requirements. The power supply is not really considered a peripheral—it's a standard accessory that comes with the machine.

Expansion Port

Again, this is not really a peripheral port, since it's most often used for cartridge-based software. Many cartridges are auto-booting, meaning you plug it in, turn on the computer, and it boots itself up without a RUN or SYS command.

Though the 128 automatically starts out in 128 mode, it can detect the presence of a cartridge for the 64 and switch into 64 mode, allowing the cartridge to auto-boot.

Voice synthesizers, some of which plug into this port, could be considered peripherals. There appears to be no problem using them on the 128.

Cassette Port

Two types of peripherals can be plugged into this port: the Commodore 64 Datassette and certain printer interfaces which draw power from one of the pins. A VIC or 64 Datassette is compatible (but not the cassette drive designed for use with the Plus/4 and 16) as are the printer interfaces.

Serial Port

This port is also used for printer interfaces, as well as for disk drives. Both the 1541 and 1571 disk drive have two ports on the back: One receives the cable running from the computer, and the other can act as a substitute serial port for additional disk drives or printers. If you have both a printer and a disk drive, you plug the disk drive cable into the serial port of the computer and the printer cable into the back of the disk drive. The disk drive, in effect, relays commands from the printer to the computer and vice versa. Compatibility does not appear to be a problem, although you may have to turn off your printer before powering on or resetting the 128.

However, the speed of your drive will vary, depending on the combination of computer/disk drive. The new protocol on the 1571 makes a combination of the 128/1571 very fast (and it's even faster when the 128 is in CP/M mode). Combinations of 64/1541, 64/1571, and 128/1541 all yield relatively slow transfer speed (300 characters per second in 64 mode, as opposed to approximately 2000 in CP/M mode).

Also, the 1571 can read double-sided disks, where the 1541 cannot. This may cause some software incompatibility in the future if developers create software that uses both sides of a disk.

Video Port

This port, which sends a signal to either a composite or a monochrome monitor, is wired exactly the same on both the 64 and 128. Whatever you're using now with your 64 should work fine on the 128.

Commodore's 1660 modem also connects to the audio pin on this port in order to emulate touch-tone dialing sounds. It works with both machines.

Low/High Switch

This switch is the same on both computers. It simply lets you choose which channel, 3 or 4, will receive a signal if you're using a TV for video display.

RF Port

If you don't own a monitor, this is where you plug in your television. The cable that plugs into the TV/computer switch box plugs in here on both the 64 and 128.

RGBI Port

This port does not exist on the 64. On the 128, it sends out two signals. Both allow for 80 columns, one in monochrome (black and white) and one in color.

If 80 columns in monochrome is good enough for you, you can continue to use either a composite monitor, like the 1701 or 1702, or a monochrome monitor. But if you want 80 columns in color, you'll need an RGBI monitor like Commodore's new 1901.

At least two companies have manufactured monitor cables that give you 80-column capability. Cardco's C128/80 ($9.95) is a single cable that connects the 128's RGBI port to the video-in plug on a monitor. To switch from 40 to 80 columns, you unplug the 40-column input before inserting the 80-column plug (or, if you have a Commodore monitor, you can use the front connections for 80-columns and the rear connections for 40, and flip the switch on the back of the monitor to go between the two screens). Microvation's 40/80 Switch ($14.95) consists of a small switch box with three cables running out. One plugs into the monitor, and the other two connect to the 128: one into the video port and one into the RGBI port. By flipping the switch on the interface, you can switch between 40 and 80 columns. (For more information, contact Cardco, 300 S. Topeka, Wichita, KS 67202, or Microvations, 8920 Arcturus Way, San Diego, CA 92126.)

Unfortunately, there is no practical way to get 80 columns if you're using a television set.

User Port

This port is used almost exclusively for plugging in direct-connect modems. The compatibility situation looks good here, as long as you are telecommunicating in 64 or 128 mode.

But the original release of CP/M for the 128 does not support telecommunications. This is not a problem with the hardware, but with the software. The upgraded CP/M release has reportedly corrected this, and includes a terminal program called MDM730, which should be compatible with all Commodore modems. (For further information, see "128 Update: An Improved CP/M" on page 38.)

Though compatibility should create very few problems as you upgrade to a 128, you may run into some annoying minor problems. For instance, some software packages require you to plug a dongle (a small plastic box used for copy protection) into the user port before running the program. Because of the differences in the plastic casing of the 64 and 128, it may be difficult to plug in the dongle.

But remember, the 128 was designed to allow 64 owners to upgrade *without* having to sink a lot of money into new peripherals, and Commodore's plan appears to have been successful.

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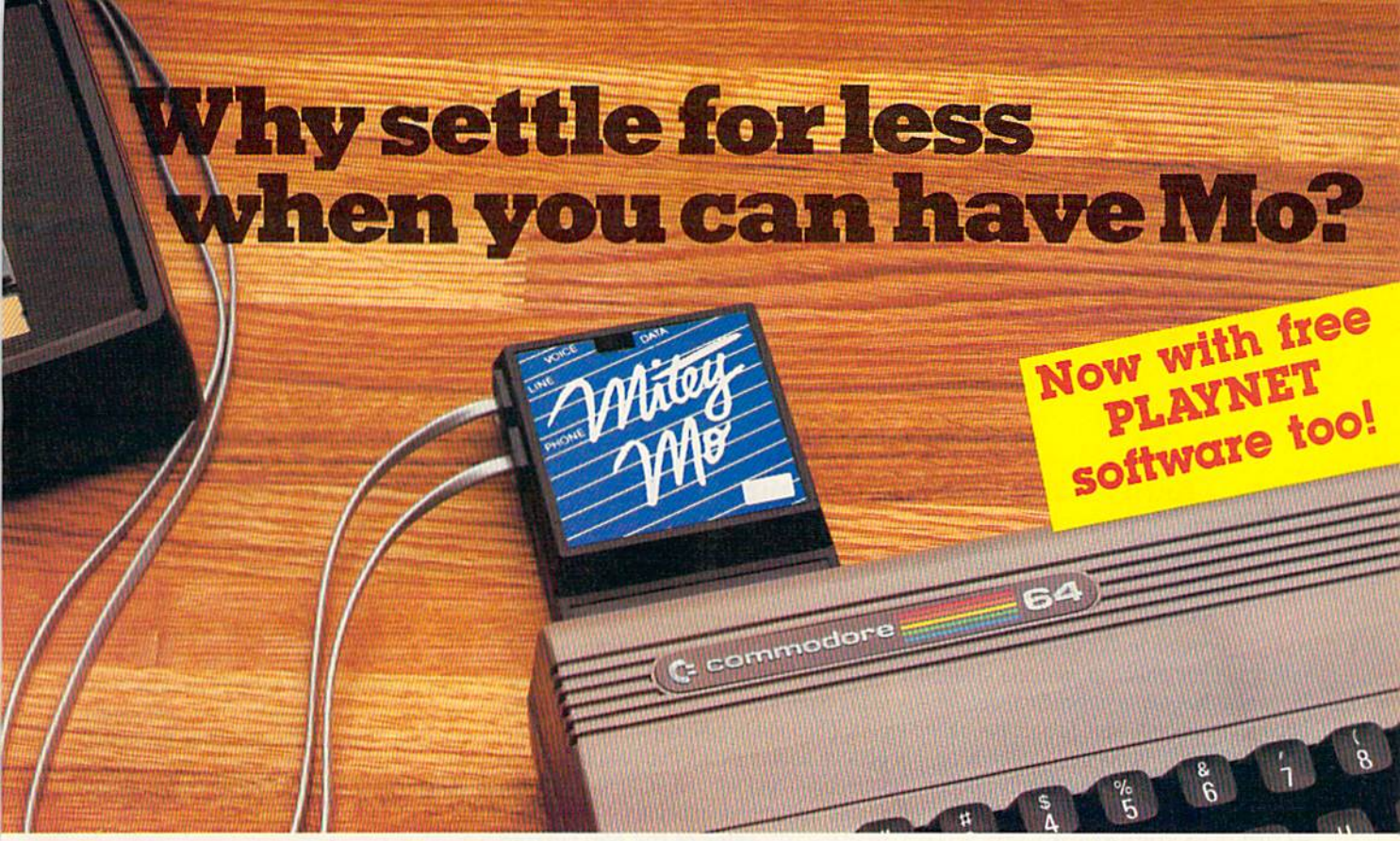

Mitey Mo turns your Commodore 64 into a telecommunications giant. It's the best-performing modem with upload/download.

Mitey Mo is being hailed as "the best price/performance communications package available." Its software has received the endorsement of the U.S. Commodore Users Group, which gives a money-back guarantee to members. It is truly the industry standard, and no wonder. It's the most user-friendly modem you can buy—it will take you online faster and easier than anything else.

Mitey Mo opens up a world of practical and exciting uses for your C-64. It lets you send and receive electronic mail, link up with community bulletin boards, play computer games with people in distant places, tap into library resources, and much more. All at your convenience.

Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for your computer. Like Mitey Mo, it has "auto answer"—it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where the similarity ends.

Mitey Mo can dial up to 9 numbers sequentially. But suppose you dial a number and find it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.

Mitey Mo is menu driven. It lists the things you can do on the screen. Select a number and you're on your way. Since Automodem isn't menu driven, you'll be hunting through the manual a lot.

With Mitey Mo, your computer's function keys are programmable—you can save yourself plenty of keystrokes. Not so with the other modem. And only Mitey Mo lets you store data to review or print it later.

Mitey Mo has just one switch, the Smart 64 software does the rest. With the other modem you'll have to remember to check three switches, otherwise you may be answering when you mean to be originating.

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Auto Redial	YES	NO
Smart 64 Software	YES	NO
Function Keys Programmable	YES	NO
Upload/Download Text & X-Modem	YES	NO
VT-52/VT-100 Emulation	YES	NO
Menu Driven	YES	NO
28K Software Buffer	YES	NO
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Bell 103 Compatible	YES	YES
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128 Update:

An Improved CP/M

Kathy Yakal, Assistant Features Editor

Commodore 128 owners who may have been frustrated by certain limitations in the original CP/M software for their machines should be able to get a significantly improved version by the time they read this.

Commodore is planning to release an upgraded CP/M for interested 128 owners which will, among other things, allow downloading of CP/M files for use in the 128, storage in the 1571 disk drive, and hard copy printouts. Commodore sources indicate that the new CP/M version will offer Commodore RS-232 compatibility, will work with a new Commodore Xmodem terminal program, and will also make the keyboard scanning function slightly quicker.

Final details had not been nailed down by Commodore at press time, but indications are that the upgrade will be free (or perhaps for the cost of the disk itself and shipping/handling charges) to those who have purchased 128s. Owners can receive the upgrade by calling Commodore Customer Support. One source indicates that Commodore may even place the new CP/M telecommunications program in the public domain.

One of the reasons for the upgrade stems from the original CP/M's lack of any telecommunications capabilities. A tremendous amount of CP/M software is in the public domain and available through online bulletin boards, making telecommunications access almost a necessity for people who want to do more with CP/M.

For those relatively new to CP/M on the 128, CP/M stands for *Control Program for Microcomputers*. Developed in 1975 by Gary Kildall for Intel's 8080 microprocessor, CP/M became the first disk-operating system (DOS) available. Kildall's company, Digital Research, later upgraded CP/M for the Zilog Z80 chip. In those days, most computers used one of the two chips, so software written for CP/M ran on most microcomputers. In fact, many early sales of the 6502-based Apple series were attributed to the availability of a Z80 plug-in card that let Apple owners run the substantial library of CP/M programs.

Obviously, there's been a lot of CP/M software out there for a long time, both commercial packages (many of which are business-oriented) and public domain programs. Much of it, but not all, runs on the 128.

The Commodore 128 is not the first Commodore product that can run CP/M. Commodore sells a package for the 64 that includes a Z80 microprocessor on a cartridge and the CP/M operating system on disk.

Some CP/M software has been designed for it, but there are problems. CP/M requires heavy access to disk, so running it on the relatively slow 1541 means a lot of down time for the user. Also, most CP/M-based computers use a 64-or 80-column screen, as opposed to the 64's 40 columns. And since the 1541 disk drive can't read a CP/M disk, you're pretty much limited to just programming the Z80 chip, and not running commercial software. The 128 is a more suitable CP/M machine because of its 80-column screen and fast 1571 disk drive.

The CP/M disk that comes with the 128 (Digital Research CP/M Version 3) includes the operating system and a few utilities to get you started. However, Commodore offers, for $20, two more CP/M system disks and a large System/User's/Programmer's Guide to CP/M which details how to use and program that operating system. (You can get this by sending in the CP/M card that comes with your 128.) This extra information can be extremely helpful, especially if you want to do any programming.

The difference between Commodore 64 or 128 software and CP/M software is like the difference between Apple software and IBM software; the programs are configured to run within operating systems based on different microprocessors. There are word processors, games, educational pieces, spreadsheets, and software for many other applications, but they were written for another operating system, so will only run on a machine that uses it. You can run *PaperClip* on both an Apple and a Commodore, but you have to have the right version for your computer.

What works on the 128? That's the big question. The best way to find out is to test a variety of programs, and the 128 has hardly been available long enough to do extensive testing.

Commodore has released a list of commercial packages that will run in CP/M on the 128. The list—with product name, company, format, and description—includes:

- *WordStar* (MicroPro) Osborne I format recommended; a word processor.
- *SuperCalc* (Sorcim) Osborne I; a spreadsheet.

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- *Punctuation Style* (Oasis Systems) Osborne I; a word processing aid.
- *Grammatik* (Aspen) Osborne I; a writing style analyzer.
- *Disk Doctor* (SuperSoft) Osborne I; a utilities package for recovering lost files from damaged disks.
- *MBasic* (Microsoft) Osborne I; a BASIC programming language.
- The *Perfect* Series (Commodore) Developed for the 128; several productivity packages.
- *Turbo PASCAL* (Borland International) Kaypro IV; a Pascal programming language.
- *Zork* (Infocom) Format uncertain; a text adventure series.

There are certainly many other programs that will work. But discovering what will and won't be compatible can be a bit frustrating. One way to go about finding even more programs is to find a dealer who will let you do some checking before you purchase the program.

If you don't regularly use CP/M software on a different computer at work or home, and don't want to spend money just to see what's available, you still have access to thousands of CP/M programs in the public domain. If there's a CP/M user group in your area (or a user group for a specific CP/M machine, like Osborne or Kaypro), you might want to attend a meeting to see what's in their library. Local newspapers and other community service publications often list meeting times for such activities; you could also check with the computer science department of a local high school or college to see if such a group meets.

In addition, there are hundreds of CP/M bulletin board systems across the country. To find one in your area, call the Peoples' Message Service, an electronic bulletin board, at (619) 444-7006 (Password: PAMS) and either search in your area code or download the list of CP/M bulletin boards from around the nation. Many online information services, like CompuServe and The Source, have Special Interest Groups (SIGs) online that offer public domain software.

Remember, however, that the initial release of CP/M for the 128 doesn't "recognize" modems, which means you can't telecommunicate while operating in CP/M mode. As mentioned above, the addition of telecommunications capability is one of the changes that Commodore has announced for the new CP/M version.

In the meantime, there are programs on CompuServe and several BBS's that make it possible to copy programs downloaded in 64 or 128 mode to CP/M format. (One such board in the Atlanta area can be reached at 404-995-0182.) The process involves downloading one of these conversion programs, then downloading a CP/M program while in 64 or 128 format on a regular disk. After disconnecting from the network, you load the conversion program, and it will copy the downloaded program to a CP/M disk in CP/M format.

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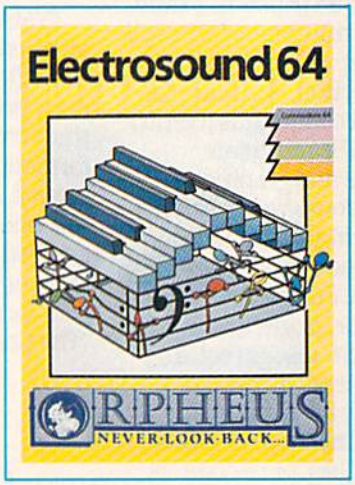

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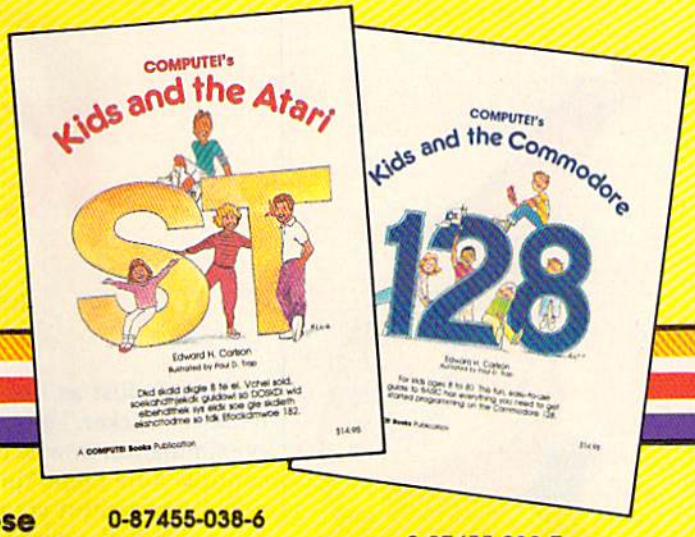

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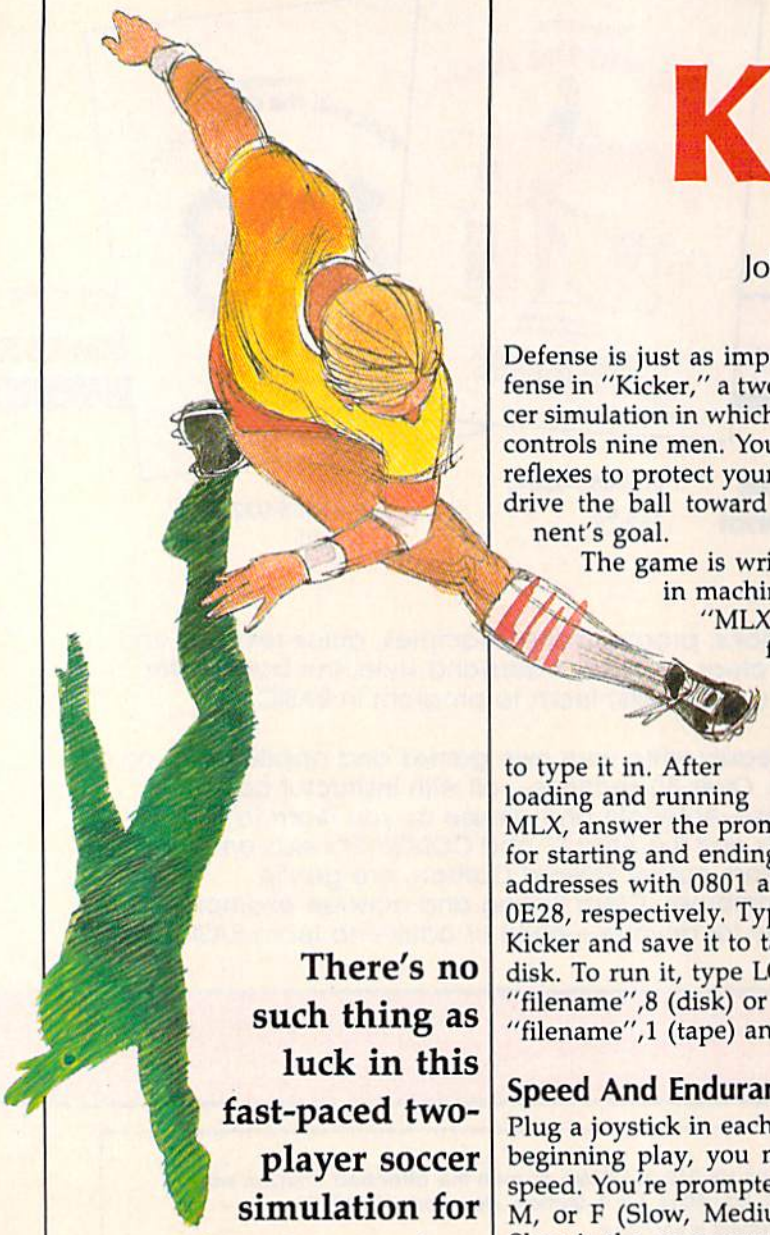


KICKER

John Krause and Mark Tuttle

There's no such thing as luck in this fast-paced two-player soccer simulation for the Commodore 64 and 128 (in 64 mode). Two joysticks are required.

Defense is just as important as offense in "Kicker," a two-player soccer simulation in which each player controls nine men. You need quick reflexes to protect your goal and to drive the ball toward your opponent's goal.

The game is written entirely in machine language. "MLX," published frequently in COMPUTE!'s GAZETTE, is required to type it in. After loading and running MLX, answer the prompts for starting and ending addresses with 0801 and 0E28, respectively. Type in Kicker and save it to tape or disk. To run it, type LOAD "filename",8 (disk) or LOAD "filename",1 (tape) and RUN.

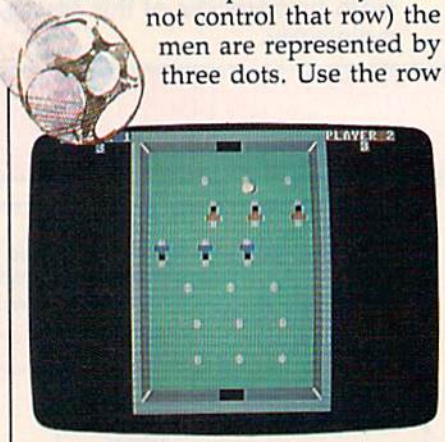
Speed And Endurance

Plug a joystick in each port. Before beginning play, you must select a speed. You're prompted to press S, M, or F (Slow, Medium, or Fast). Slow is the recommended level to start with so that you can get a good feel for the game, although the medium speed is probably the level you'll choose most often. Here, the speed is competitive and your wrists may last for the entire game. The Fast level should be attempted only by diehard Kicker fanatics.

Player one, the blue team, and player two, the red team, control three rows of three men each. But each player can access only one row at a time. Move the joystick up to select the top row, down to select the bottom row, or leave it centered for the middle row.

After choosing a row, you can move the joystick left or right to shift the entire row and get your men into position to kick the ball. When the ball comes near one of your men, press the fire button to kick the ball in the direction of your opponent's goal. (The game is designed so that you can kick the ball only in the direction of your opponent's goal. You can't accidentally kick the ball into your own goal.) Kicking the ball requires split-second timing. Holding down the fire button won't do. You must press the fire button at the moment the ball comes in contact with your player. Otherwise the ball will continue past your player. Remember, selecting a row will not allow you to kick the ball. You must activate the row by pressing the fire button.

When a row is inactive (the fire button is not pressed or you do not control that row) the men are represented by three dots. Use the row of men nearest your goal to block shots by your opponent. The scores of both players are displayed at the top of the screen. After each goal, a bell sounds and a red or blue light, representing the color of the scoring team, flashes in the goal area. The ball is placed in the center of the field at the beginning of the game and after each goal. The first player to score nine goals is the winner.



Player 2 (red) is about to be scored on again in "Kicker."

See program listing on page 114.

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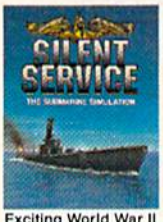

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LEXITRON

Ron Wilson

Like a bowl of alphabet soup, the "Lexitron" screen appears to be just a jumbled mass of letters. Can you find the ten hidden words before time runs out? A challenging game with three skill levels for the Commodore 64, 128, Plus/4, and 16. A joystick is required.

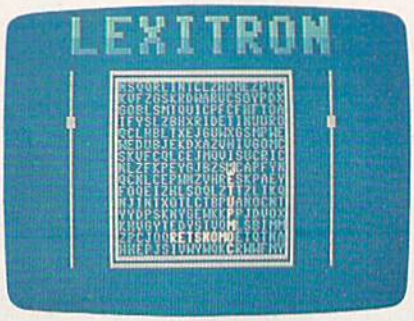
If you enjoy the hidden word games often found in newspapers and magazines, you'll like "Lexitron." But unlike the ones done with pencil and paper, Lexitron adds a few twists. There's a time limit, and you can select one of three difficulty levels.

The game is written entirely in BASIC for the Commodore 64 and 128 (in either 64 or 128 mode). After typing it in, be sure to save a copy. If you're planning to run it in 128 mode on the 128, add this line to make sure the POKEs go to the right bank of memory:

```
10 BANK 15
```

Plus/4 and 16 users should substitute the following lines in the 64 version:

```
140 VOL8
150 SC=3322:CD=-1024:BC=65301:
    W=241:BL=241:SB=65286:CS=
    255
160 Z=1339:A1=0:A2=6:A3=2:A4=5
    0:A5=0:A6=102:COLOR4,1
410 J=JOY(1):RETURN
480 SOUND 1,262,10:SOUND 1,453
    ,20
540 SOUND 1,453,10:SOUND 1,262
    ,20
630 FORA=100TO500STEP20
640 SOUND1,A,3:SOUND2,A-3,3:NE
    XT
```



An example of level 2 play. Note that the words found are in reverse spelling order.

Be especially careful when typing in the DATA statements in lines 1200 and 1210. These lines hold the word pool from which Lexitron selects.

Up, Down, Left, And Right

To play Lexitron, load it and type RUN. Be sure to have a joystick plugged into port 2 (port 1 for the Plus/4 and 16 version). First, you'll be asked to select one of three skill levels. Level 1 is the easiest, with all the hidden words spelled left to right or top to bottom. Level 2 is more difficult. Besides forward spellings, words are also formed in their reversed spelling order (from right to left or bottom to top). Level 3 is the most difficult, with words spelled diagonally and both forward and reversed diagonal words being formed. You might want to stay clear of level 3 until you've played a few times.

After you've selected a skill level by moving your joystick to the appropriate number, press the fire button. The screen will clear for a few seconds while the game words are being selected and hidden. But don't leave your seat—the timer starts as soon as the game appears on the screen.

Using your joystick, move the cursor to the word you've found, and press the fire button on each letter until you complete the word. Each time a correct letter is registered, the time level, which moves from top to bottom, is pushed back toward the top. Avoid guessing letters by trial and error. Wrong entries only reduce the amount of time.

All valid game words are at least six letters long. This rule is in force so that accidental (and sometimes humorous) letter combinations do not cost you time and effort. You'll often see words like MAN, CAR, SEE, or TRY, but Lexitron does not recognize them. Also be aware of letter additions. For example, Lexitron may choose and

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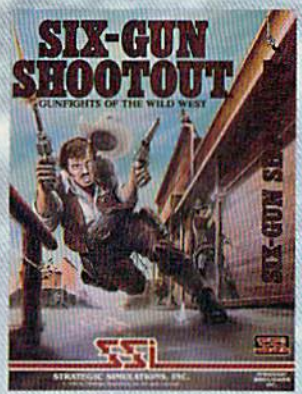

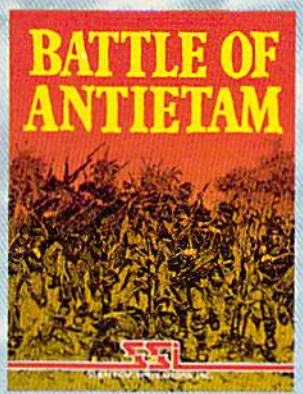

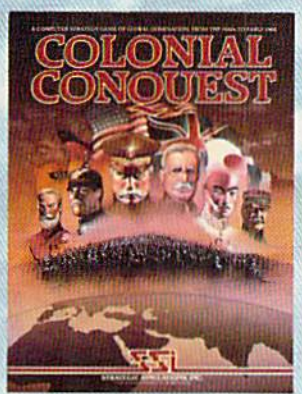

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When time has expired, the computer displays the hidden words in black.

hide the word AMERICA, but by chance the letter following could be an N, thus AMERICAN. Lexitron may not recognize the extra N.

Easy Modifications

The Lexitron vocabulary words are coded so that players cannot list the program and get an illegal sneak preview. If you wish to add your own words to the program, the code is simple. Each letter represents the letter which alphabetically follows. For example, the letter A is coded as B. ABACUS would be coded as BCBDVT. If you decide to add your own words, start with a new line—1220—and remember that all words must be at least six letters long. Be sure the last word in the list is FOE (the word END in code). This signals to the program that it's reached the end of the word list. You might want to consider using words with the letters X, Z, or the Q-U combination. A sharp player can spot words with those letters in seconds.

If you find that Lexitron is too easy or too difficult, you can change the value .009 in line 330. This controls the timer. Raising and lowering this value will change the allotted time, thus the difficulty of the game. A value less than .009 (such as .007) makes the game easier, and, conversely, increasing the value makes it more difficult.

There are a few strategies to consider when playing Lexitron. For instance, in some cases it's not to your best advantage to enter a word as soon as you find it. If you have trouble finding some of the hidden words, Lexitron sometimes provides a clue by flashing a word at the bottom of the screen.

See program listing on page 115.

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simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

Q. I've hooked up my Commodore 64 to a stereo system by attaching one end of a length of audio/video cable to a five-pin DIN plug which connects to the audio/video jack on the back of the 64. With this type of hookup, is it possible to record any music from the computer onto cassette? A friend told me that if you connect a stereo cassette deck to the amplifier, you can record any sound produced by the computer in stereo on a cassette. I have many music programs for my 64 that I'd love to record on tape.

A. You can indeed record any computer sounds from your 64 on tape with this setup, but they won't be in stereo. The Commodore 64 audio output is monophonic. To make sure the computer sound is recorded on both stereo channels of the tape, though, you should split the 64's audio output with a Y-adapter (available at nearly any electronics store, such as Radio Shack). Plug the two ends of the Y-adapter into the left and right auxiliary inputs on your stereo amplifier or receiver (TAPE INPUT or TAPE MONITOR jacks also work). At this point, the amplifier/receiver sees the computer as just another signal source, like a turntable, tape deck, tuner, or compact disc player. To record computer sounds on cassette, follow the same procedure you use for taping records or anything else—switch the selector on the amplifier/receiver to the signal source you want to record (in this case, AUXILIARY), and start the recorder.

The Commodore 64 puts out a fairly pure audio signal, but it can be improved if your stereo system includes an equalizer. You can filter out any high-frequency hissing or whistling, and boost the bass. If your equalizer and cassette deck are connected to the amplifier/receiver's tape monitor loop, you can even capture this equalization on tape.

If you really want "stereo" sound from your 64, you can route the computer's audio output through an outboard stereo synthesizer. These synthesizers are generally intended for converting TV audio into simulated stereo, but they'll work with nearly any audio signal. We've also produced some rather bizarre sounds by sending computer audio through special-effects devices made for electric guitars, such as stereo chorus boxes, phase shifters, and fuzz distorters.

Q. Is it possible to use the Amiga high-resolution monitor and disk drive with the Commodore 64 and 128?

A. The Amiga color monitor works with the Commodore 64 and 128, but the disk drive does not.

The Amiga monitor that was shipped last fall appears to be an enhanced version of the Commodore 1902 monitor introduced for the 128. It has all the features of the 1902—including digital RGB (red-green-blue) input and composite video input—plus an analog RGB input for the Amiga. That means it will work with virtually any personal computer on the market. You'd plug a Commodore 128 into the composite input (for 40 column mode) and digital RGB input (for 80 columns), or you'd plug a Commodore 64 into the composite input. The Amiga monitor even has separated composite video—that is, separate chroma and luma inputs—similar to the rear connections on the Commodore 1701, 1702, and 1902 monitors.

However, at this writing (early November) the Amiga monitor is nearly impossible to obtain. We hear that Commodore is redesigning it to include twin speakers and audio inputs for stereo sound. The Amiga computer has true stereo sound output, but the current Amiga monitor has only one speaker and a single audio input.

Q. I use an excellent-quality, small color TV with my Commodore 64. When the computer and TV are turned on, there is constant movement of vague images on the screen—a rippling effect like a curtain, first from one corner, then another. Can you help me solve this irritating problem?

A. Assuming that your TV is in good order, this sounds like a common case of RFI (radio frequency interference) from the computer. All computers emit RFI to some degree, and TVs vary in their susceptibility. Even disk drives and other peripherals emit RFI, because they contain computers, too. You can experiment with several solutions: Move the TV further away from the computer and peripherals; make sure the cable connecting the computer and TV is the shielded type and is no longer than necessary; collapse the TV's rabbit-ear antenna when using the computer; and plug the TV and computer into wall outlets which are wired on separate circuits. You can also buy RFI filters which plug in between the TV's power cord and the wall outlet. None of these things may help, but they're worth a try.

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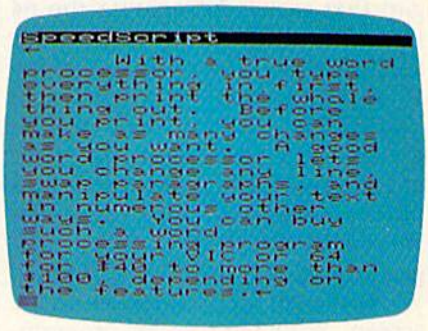

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Emulating The Amiga

Charles Brannon
Program Editor

From what's been written about the Amiga, it would seem obvious that the Commodore Amiga is "better" than the Commodore 64, but the gap that seems to separate the 64 from the Amiga may not be so wide as you think. When you're looking at any new computer, beware of "show off" demonstration programs. Very often these programs are contrived examples of the computer's power. You may remember the early claims and demo programs made for the 64 that claimed you could get up to 64 sprites on the screen. With very tricky programming, that's true; but almost no software for the 64 uses more than eight sprites.

One of the Amiga's powerful features is its hardware-assisted memory move circuitry, the *blitter.* The blitter can move any piece of memory to any other place, even modifying the data as it's copied, while the main processor, the 68000, continues to work. This capability is stunningly demonstrated with an Amiga program called "Boing," which animates and rotates a huge checkered ball. "Boing" has become a symbol of the Amiga, with the bouncing checkered ball featured prominently in many ads.

Moving a large object like the ball is impressive, but the way the ball smoothly rotates on its axis is the truly amazing part. By looking at the graphics screen before the program was finished initializing the ball, I realized that Boing "cheats." It doesn't actually rotate the ball using multiple shapes or some kind of high-speed 3D trigonometry. Although only two colors are used for the red and white checkered ball, the ball is divided into dozens of colored slices. It's as if you took an orange and separated it into thin sections. The peel of each section would be a different color. And by rotating just the colors, by changing the colors of the slices, the colors seem to move around the ball, making the ball appear to rotate. This technique is not new, nor is it limited to computer graphics; movie marquees and neon signs can give the impression of movement when selected lights are turned on and off.

On the 64, color rotation normally doesn't make sense. If you draw something green, it *is* green. To change a green box into a blue box, you'd have to overwrite the green box with a new blue box, redrawing the entire shape, or at least changing sections of color memory. Even in machine language, redrawing large shapes can be too slow for smooth motion. However, some colors on the 64 are indirect. If you POKE to the background color, for example (POKE 53281,1), the background color instantly changes—you don't have to redraw the screen. The two additional colors in multicolor mode, and all sprite colors behave the same way. If you change a sprite color register, the sprite's color changes instantly—you don't have to redefine a sprite to change its color.

If the Amiga can do it, so can the 64. My program, called "Bounce," is an attempt to emulate the Amiga "Boing" demo. Seven sprites are used to draw the ball, and the eighth is used for the ball's shadow. Each of the first seven sprites is one wedge of the ball. The colors for the ball are defined in line 300 of Program 1. The pattern creates a red ball with two thin white bands. Program 2 rotates the colors during the interrupt (in the background) while BASIC runs. It lets BASIC simply POKE to a horizontal register and a vertical register to instantly move all eight sprites to any new location. A speed register controls the rate of rotation, and a direction register controls whether the ball spins to the left or to the right. So rotating the ball, as on the Amiga, uses only a small part of the 64's total processing power. A slow language like BASIC is plenty fast enough to move the ball, with machine language doing much of the work in the background.

The sound effect is particularly interesting, and credit is due to our resident SID chip expert, Phil Nelson, assistant editor of COMPUTE! magazine. He created a sound effect that combines the low pitch of a pulse wave with the sharp sound of white noise to get a combined sound that's an effective boom. The SID filter is employed to accentuate the bass and filter out the hiss of the white noise, giving a deep, enclosed boom, as if a large ball really was bouncing in a small room. However, not all SID chips sound the same, particularly where the filter is concerned. If your boom sounds bad, you may want to change the last two numbers in line 240 from 245,47 to 0,15 to disable the filtering.

The Amiga demo seems to make the claim that rotating a large object smoothly is something inherently possible only on the Amiga. Although Amiga's "Boing" is certainly more sophisticated, I think the 64 program admirably competes. The underlying trick, color rotation, although more powerful and subtle with the Amiga's 32 color registers as compared to just eight sprite color registers, works well on both machines. So when an Amiga fan (and I'm one) shows off his computer and attempts to denigrate the 64 or 128, just remind him that all computers are more or less equal—some are just *different* than others.

Typing In "Bounce"

Program 1 is the main program that loads in the machine language (Program 2) and the sprite shapes (Program 3—which is not actually

a program). Type in Programs 2 and 3 with MLX. Use a starting address of C000 and an ending address of C0EF for Program 2, and save it to disk as "SPROT.OBJ". For program 3, use 3E00 for the starting address, 3FFF for the ending address, and save it as "IMAGES". To start the demo, just run Program 1. It automatically loads the other programs. Tape users will have to change the eights to ones in lines 120 and 130 and make sure the programs are saved in the correct order.

If you want to use this bouncing ball in your own program, experiment with the color table in line 300. If you change it to 0,9,9,9, 0,9,9,11 you'll get something that looks like a basketball. You can use the variables defined in line 180 to control the ball. SYS INIT starts the ball rotating; SYS OFF stops the rotation and disables the special interrupt. POKE a number from 0 to 255 into XP (X-position) and YP (Y-position) to change the position of the ball. POKE DIR with either 1 for left-to-right rotation or 255 for right-to-left rotation. And POKE SPEED to control the rate of rotation, from 0 (fastest) to 3 (slowest usable speed).

Program 1: Bounce

```
FA 100 REM BOUNCER V1.0
KP 110 IF PEEK(49152)=76 AND A
       =0 THEN SYS 49155:GOTO
       {SPACE}140
MS 120 IF A=0 THEN A=1:LOAD "S
       PROT.OBJ",8,1:REM LOAD
       {SPACE}MACHINE LANGUAGE
PK 130 IF A=1 THEN A=2:LOAD "I
       MAGES",8,1:REM LOAD SPR
       ITES
JS 140 POKE53280,11:POKE53281,
       11
FC 150 PRINT"{CLR}{43}{DOWN}
       {5 SPACES}{RVS}{30 Y}"
BK 160 FORI=1TO21:PRINT"
       {5 SPACES}{RVS} {OFF}OO
       OOOOOOOOOOOOOOOOOOOOOO
       OOO{RVS} ":NEXT
DB 170 PRINT"{5 SPACES}{RVS}
       {30 SPACES}{HOME}":POKE
       53281,12
XA 180 INIT=49152:OFF=49155:SP
       EED=49158:DIR=49159:XP=
       49160:YP=49161
DA 190 SYS OFF:POKE XP,0:POKE
       {SPACE}YP,0:REM MAKE SU
       RE BALL IS NOT ROTATING
        OR VISIBLE
QD 200 FORJ=0TO24:POKE54272+J,
       0:READ X:POKE54272+J,X:
       NEXT:REM INIT SID FOR B
       OOM
SA 210 DATA 0,4,0,12,64,10,0
AH 220 DATA 0,0,0,12,64,12,0
XC 230 DATA 0,4,0,12,128,12,0
JR 240 DATA 0,50,245,47
DG 250 FOR I=0 TO 7:POKE 2040+
       I,248+I:NEXT:REM SELECT
        SPRITE SHAPES
DR 260 POKE 53271,255:POKE 532
       77,255:REM MAKE BALL DO
       UBLE-SIZE
BF 280 FOR I=0 TO 7:READ C:POK
       E 53287+I,C:NEXT:REM RE
       AD IN SPRITE COLORS
HJ 290 POKE 53269,255:REM ENAB
       LE ALL SPRITES
FK 300 DATA 1,1,2,2,2,2,2,11:R
       EM LAST NUMBER IS SHADO
       W'S COLOR
PE 310 POKE DIR,1:REM ROTATE T
       O THE RIGHT
KR 320 SYS 49152:REM IT ROTATE
       S
FF 330 X1=70:Y1=66:X2=249:Y2=1
       98:X=X1:Y=(Y2-Y1)/2+Y1:
       XD=2:YD=2
PX 340 POKE XP,X:POKE YP,Y:POK
       E DIR,1-254*(XD<0):REM
       {SPACE}UPDATE BALL ON S
       CREEN
RB 350 X=X+XD:Y=Y+YD:REM ADJUS
       T POSITION ACCORDING TO
        DELTA X AND DELTA Y
QM 360 IF X<X1 OR X>X2 THEN XD
       =-XD:GOSUB 390:REM BOUN
       CE-REVERSE DIRECTION AN
       D SPIN
DA 370 IF Y<Y1 OR Y>Y2 THEN YD
       =-YD:GOSUB 390:REM BOUN
       CE-REVERSE DIRECTION
RQ 380 GOTO 340
QA 390 POKE54276,64:POKE54290,
       128:POKE54276,65:POKE54
       290,129:RETURN
```

Program 2: Machine Language For Bounce

MLX is required to type this program in. See instructions in article.

```
C000:4C 0D C0 4C 36 C0 01 FF 7E
C008:64 64 00 00 00 78 A9 00 0A
C010:8D 0E DC A9 1B 8D 11 D0 14
C018:A9 01 8D 1A D0 A9 FF 8D BC
C020:12 D0 A9 4D 8D 14 03 A9 55
C028:C0 8D 15 03 A9 00 8D 0A B2
C030:C0 8D 0C C0 58 60 78 A9 E1
C038:31 8D 14 03 A9 EA 8D 15 91
C040:03 A9 00 8D 1A D0 A9 01 EE
C048:8D 0E DC 58 60 A9 FF 8D 6C
C050:12 D0 A0 0C AD 08 C0 99 8C
C058:00 D0 AD 09 C0 99 01 D0 93
C060:88 88 10 F0 AD 08 C0 18 80
C068:69 04 8D 0E D0 AD 09 C0 42
C070:18 69 04 8D 0F D0 EE 0C 57
C078:C0 AD 0C C0 CD 06 C0 90 EB
C080:61 A9 00 8D 0C C0 AD 07 BB
C088:C0 30 2C AC 0A C0 D0 0B C6
C090:AD 2D D0 8D 0B C0 A0 06 C9
C098:8C 0A C0 B9 26 D0 99 27 65
C0A0:D0 B9 25 D0 99 26 D0 88 3A
C0A8:88 8C 0A C0 D0 34 AD 0B 9C
C0B0:C0 8D 27 D0 4C E2 C0 AC 04
C0B8:0A C0 D0 06 AD 27 D0 8D 23
C0C0:0B C0 B9 28 D0 99 27 D0 BD
C0C8:B9 29 D0 99 28 D0 C8 C8 04
C0D0:8C 0A C0 C0 06 D0 0B A0 69
C0D8:00 8C 0A C0 AD 0B C0 8D 73
C0E0:2D D0 A9 01 8D 19 D0 4C 31
C0E8:31 EA 00 00 00 00 00 00 BD
```

Program 3: Sprite Shapes For Bounce

MLX is required to type this program in. See instructions in article.

```
3E00:00 00 00 00 00 00 02 00 80
3E08:00 06 00 00 0C 00 00 1C 82
3E10:00 00 18 00 00 38 00 00 70
3E18:38 00 00 38 00 00 38 00 A4
3E20:00 38 00 00 18 00 00 1C 87
3E28:00 00 0C 00 00 06 00 00 3E
3E30:02 00 00 00 00 00 00 00 AD
3E38:00 00 00 00 00 00 00 FF B4
3E40:00 00 00 00 C0 00 01 C0 85
3E48:00 01 80 00 03 80 00 03 32
3E50:80 00 07 00 00 07 00 00 0A
3E58:07 00 00 07 00 00 07 00 D6
3E60:00 07 00 00 07 00 00 03 D9
3E68:80 00 03 80 00 01 80 00 92
3E70:01 C0 00 00 C0 00 00 00 A3
3E78:00 00 00 00 00 00 00 FF F4
3E80:00 00 00 00 20 00 00 20 1E
3E88:00 00 60 00 00 60 00 00 92
3E90:60 00 00 E0 00 00 E0 00 0D
3E98:00 E0 00 00 E0 00 00 E0 35
3EA0:00 00 E0 00 00 E0 00 00 BC
3EA8:60 00 00 60 00 00 60 00 1C
3EB0:00 20 00 00 20 00 00 00 36
3EB8:00 00 00 00 00 00 00 FF 35
3EC0:00 00 00 00 18 00 00 18 16
3EC8:00 00 18 00 00 18 00 00 A8
3ED0:18 00 00 18 00 00 18 00 0B
3ED8:00 18 00 00 18 00 00 18 34
3EE0:00 00 18 00 00 18 00 00 C0
3EE8:18 00 00 18 00 00 18 00 23
3EF0:00 18 00 00 18 00 00 00 34
3EF8:00 00 00 00 00 00 00 FF 75
3F00:00 00 00 00 04 00 00 04 A2
3F08:00 00 06 00 00 06 00 00 5F
3F10:06 00 00 07 00 00 07 00 10
3F18:00 07 00 00 07 00 00 07 97
3F20:00 00 07 00 00 07 00 00 9B
3F28:06 00 00 06 00 00 06 00 16
3F30:00 04 00 00 04 00 00 00 CF
3F38:00 00 00 00 00 00 00 FF B6
3F40:00 00 00 00 03 00 00 03 D9
3F48:80 00 01 80 00 01 C0 00 B4
3F50:01 C0 00 00 E0 00 00 E0 67
3F58:00 00 E0 00 00 E0 00 00 76
3F60:E0 00 00 E0 00 00 E0 00 1F
3F68:01 C0 00 01 C0 00 01 80 30
3F70:00 03 80 00 03 00 00 00 D7
3F78:00 00 00 00 00 00 00 FF F6
3F80:00 00 00 00 00 00 00 00 FE
3F88:40 00 00 60 00 00 30 00 8D
3F90:00 38 00 00 18 00 00 1C F9
3F98:00 00 1C 00 00 1C 00 00 0B
3FA0:1C 00 00 1C 00 00 18 00 1F
3FA8:00 38 00 00 30 00 00 60 17
3FB0:00 00 40 00 00 00 00 00 37
3FB8:00 00 00 00 00 00 00 FF 37
3FC0:00 00 00 00 FF 00 03 FF 45
3FC8:C0 07 FF E0 0F FF F0 1F F0
3FD0:FF F8 1F FF F8 3F FF FC 33
3FD8:3F FF FC 3F FF FC 3F FF FC
3FE0:FC 3F FF FC 1F FF F8 1F 87
3FE8:FF F8 0F FF F0 07 FF E0 0C
3FF0:03 FF C0 00 FF 00 00 00 09
3FF8:00 00 00 00 00 00 00 FF 77
```


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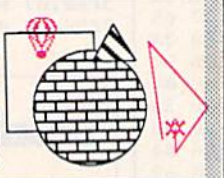

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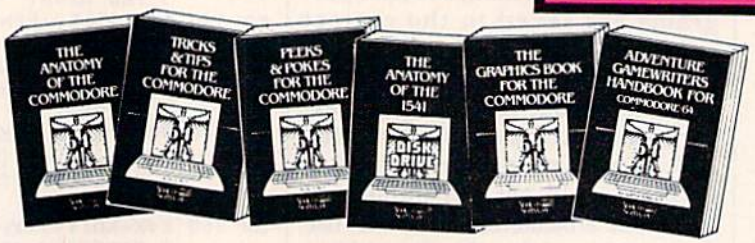
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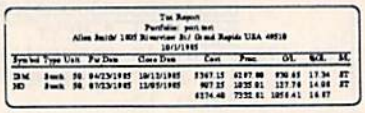

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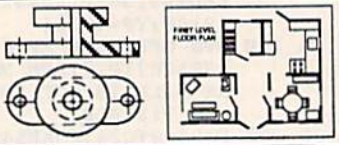

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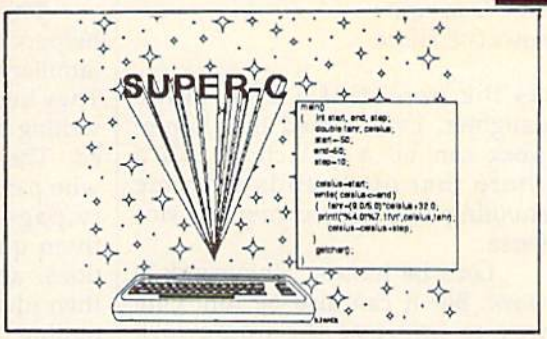

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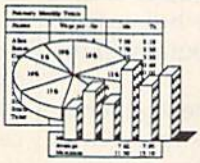

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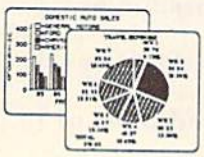

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Homework Helpers

Fred D'Ignazio
Associate Editor

As the parent of a fifth-grade daughter, I've learned that homework can be a real chore. It's a chore that often ends with me shouting and Catie crying. Or vice versa.

Let's be honest: Homework *is* work. But it can also be fun. One way to improve the homework done in your house is to use *homework helpers*, kid-style "productivity" programs that run on popular computers.

Probably the most familiar homework helper is the word processor. It teaches children that writing is *rewriting*. It frees children from the laborious mechanics of writing, and lets them concentrate instead on creating, reshaping, and clearly expressing their ideas.

Word processors have been joined by some other powerful homework helpers, including database programs and spelling checkers. When you shop for a homework helper for your child, look for one that's a member of a family of homework helpers that allow material created with one program to be used by another program. For example, a child can create an outline of major ideas for a report with a filing program. Then she can feed the outline directly into a word processor. After she's converted the outline into a report on the word processor, she can run it through the spelling checker.

As a parent, I was worried that if the computer corrected my daughter's spelling errors, she'd never learn to be a good speller. But the better spelling checkers anticipate this worry. Instead of automatically correcting an error, they offer several possible spellings and make the child choose the correctly spelled word, then type it into the computer.

There are new homework helpers that supplement the more familiar writers, spellers, and filers. They help children with the biggest writing problem of all: getting started. The programs coach children who panic when they see that empty page—or screen—by asking them questions, offering suggestions, and helping them organize their ideas and information into an outline. Later, the programs help children convert their outline into a rough draft report. They encourage children to go back and rewrite sentences, change words, and check spelling and punctuation, until they have a final draft they can be proud of. Other homework helpers assist children in solving word problems in math, researching their reports, and studying for tests. And don't worry about the programs doing the homework for your child. They help with some of the mindless, boring parts of homework, but they make your child think harder than she ever has before.

To help your child with research, some of the filing programs come with databases in all sorts of subjects, including the physical and life sciences, language arts, U.S. government, and U.S. history. Your child can use the databases like electronic encyclopedias. But she has to know what questions to ask and how to organize her information before the computer will reveal a single fact.

And some of the new general-purpose programs help a child study for a test by encouraging her to isolate the most important facts in a lesson and organize those facts into questions and answers in practice tests that she takes and the computer scores. These "test-generators" can be used in any subject.

Why should your child use a homework helper?

She doesn't need one, of course. She can do everything that a homework helper does, with file cards, paper, and a pencil. And she can do it less expensively, too.

Homework helpers are not a necessity, but they can add a lot to your child's homework experience. First, they are so practical and so much fun that they act as a powerful incentive for her to start her homework earlier and work on it harder. For example, Catie hates studying for tests for which she has to memorize facts. But recently, using test-generator programs, she's begun studying for tests days in advance, on her own, without prodding from her parents. That's because these programs make the studying process more active and more playful. They force Catie to use her mind to organize the information, then they playfully organize the information in all sorts of ways and ask her questions about it.

Last, and most important, homework helpers teach valuable skills that I, for one, never mastered until I got to college. I was too busy trying to memorize facts, like the names of the fifteenth-century explorers who sailed for Spain, and when Emily Dickinson was born. Are these the most valuable skills that homework should be teaching?

No!

The most important skills homework can teach are self-discipline, responsibility, and vital thinking, learning, and communications skills that we can carry with us into our adult lives. Homework helpers enable children to focus on these skills. And once children have internalized them, they can tackle any subject—with or without a computer.

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Send typed additions, corrections, and deletions for this list to:

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Attn: Commodore User Groups

User Group Notes

The new address for the Personal Touch Commodore User Group of Hoxie and Walnut Ridge is c/o Larry Simmons, 503 Kaylynn Dr., Walnut Ridge, AR 72476.

Also listing a new address is the Stone Mountain Users Group (SMUG 64/128): P.O. Box 1762, Lilburn, GA 30247.

The Auburn Commodore Computer Club's new address is: 337 Racetrack St., Auburn, CA 95603.

The new address for the Clearwater Commodore Club is P.O. Box 11211, Clearwater, FL 33516.

A new user group is forming called Meeting C-64 Users Through the Mail. Contact Kirby Herazy, 51 Thornhill Dr., Danville, IL 61832.

The Commodore Club of Central Ohio (CCCO) has a new address: P.O. Box 292392, Columbus, OH 43229.

Also listing a new address is the Commodore Users Group of Odessa (CUGO): P.O. Box 12491, Odessa, TX 79768.

The University of Washington Commodore Users Group can now be reached at P.O. Box 75009, Seattle, WA 98125.

The Coulee Country Commodore Club has a new address: 501 1/2 St. Cloud St., La Crosse, WI 54603.

The Sarnia Commodore Users Group (formerly the Sarnia C-64 Users Group) can now be reached c/o Lloyd Windover, 1276 Giffel Rd., Sarnia, Ontario, Canada, N7S 3K7.

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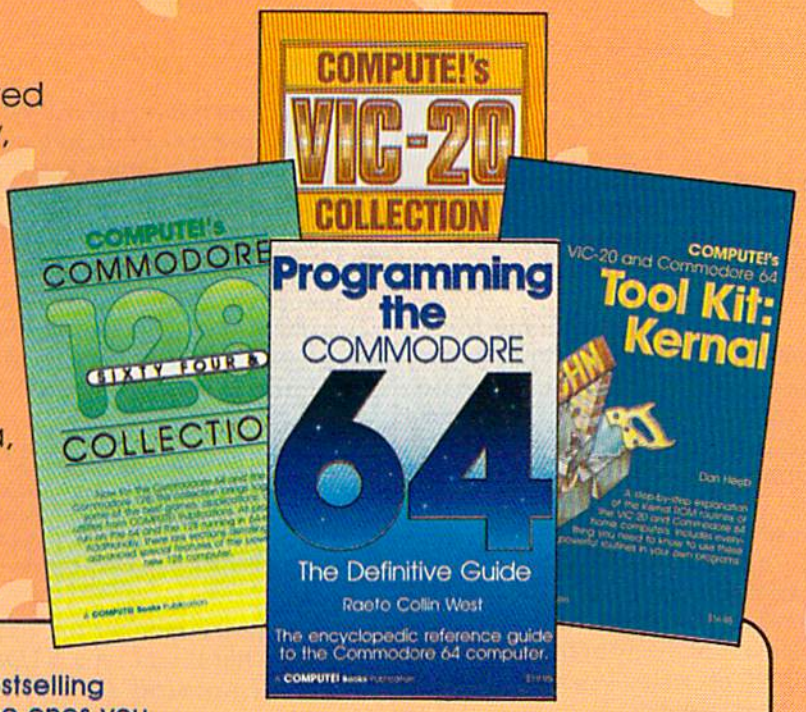

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BASIC magic

Understanding Device Numbers

Michael S. Tomczyk

Last year, we set two goals for this column: to provide a beginner's introduction to common BASIC commands, and to show how variables work.

This year, we continue to explore BASIC "magic" from a beginner's viewpoint, but our emphasis is going to shift slightly to include the use of your disk drive and printer.

The reason for this shift is because computers are no longer simple hobby machines, or even learning machines. They've become *system* machines—and this system includes your disk drive and printer as well as your computer and video screen.

So let's start with some introductory programs to get you started.

Opening And Closing Channels

To send information to your printer, disk drive, modem or even the computer screen, you have to *open* a channel using the OPEN command and the proper device number.

Here are the most common device numbers used by Commodore computers:

Device	Number
Keyboard	0
Cassette Recorder	1
Telephone Modem	2
Screen	3
Printer	4–7
Disk	8–11

Before communicating with a particular device, you must first *open* a file to that device. In a command like OPEN 1,4 the first number is the *file number* and the second is the *device number* (device 4 is the printer). The PRINT# command is used to send characters to a particular device. In our example, PRINT#1,"HELLO" tells the printer to print the word HELLO. When you're finished using the device, you must *close* that file with CLOSE 1.

Using Device Numbers With Tape Or Disk

You probably already know how to save and load programs to and from your tape or disk drive. The standard formats are shown here:

Function	Command
Save program on tape	SAVE"*filename*"
Load program from tape	LOAD"*filename*"
Save program on disk	SAVE"*filename*",8
Load program from disk	LOAD"*filename*",8
Load directory from disk	LOAD"$",8 (then LIST)

The device number for a tape drive is 1, but if you type a LOAD or SAVE command all by itself without any device number at the end, your computer automatically assumes you're using tape. That's because tape was popular before disks, and thus cassettes inherited the "default" mode.

You should also use a ,*1* at the end of the command if you're loading a machine language program and you want to make sure it relocates itself to its original memory location.

The device number for a single disk drive is 8, although it's possible to "daisy chain" or link several drives together, which may be numbered 8 to 11. Many experienced programmers connect different disk drives to their computers and give each drive its own device number, from 8 to 11.

To reiterate, you don't need to use a device number if you're saving or loading programs on tape—but you need to include the number 8 at the end of your disk commands.

The newest Commodore computers—the 128, Plus/4, and 16—contain an improved BASIC which includes special disk commands such as "DLOAD". They do not require a device number, although all Commodore computers will work with the commands shown in the chart above.

The device number for telecommunications modems is 2, but we'll leapfrog modems for the meantime.

Reading The Keyboard

To get input from the keyboard, you normally use INPUT. Another way is to open a file to the keyboard using a device number of 0, and use INPUT#. It's best use is to eliminate the question mark which appears automatically when you use the INPUT command.

For example, let's say you wanted the user to type in a long list of numbers opposite a list of categories or items. You might want to eliminate the question mark and use, instead, a colon or dollar sign. Here's a quick example:

```
10 OPEN 1,0
20 PRINT CHR$(18) CHR$(147)"BU
   DGET CALCULATOR":PRINT
30 PRINT"RENT.........$";
40 INPUT#1,A:PRINT
50 PRINT"FOOD.........$";
60 INPUT#1,B:CLOSE 1:PRINT
70 PRINT:PRINT"YOUR FOOD AND R
   ENT"
80 PRINT"TOTAL IS $"A+B
90 PRINT"PER MONTH."
```

Line 10 opens file 1 to the keyboard (device 0).

Line 20 uses CHR$(18) to print the title line in *reverse* characters, uses CHR$(147) to clear the screen, then prints the title and a blank line.

Line 30 prompts the user to enter the monthly rent.

Line 40 uses INPUT#1 instead of the familiar INPUT command. INPUT#1 displays the number which is typed in immediately at the end of the PRINT statement in line 30—*but without displaying an INPUT question mark.* Dropping the question mark allows the user to type the number right next to the dollar sign.

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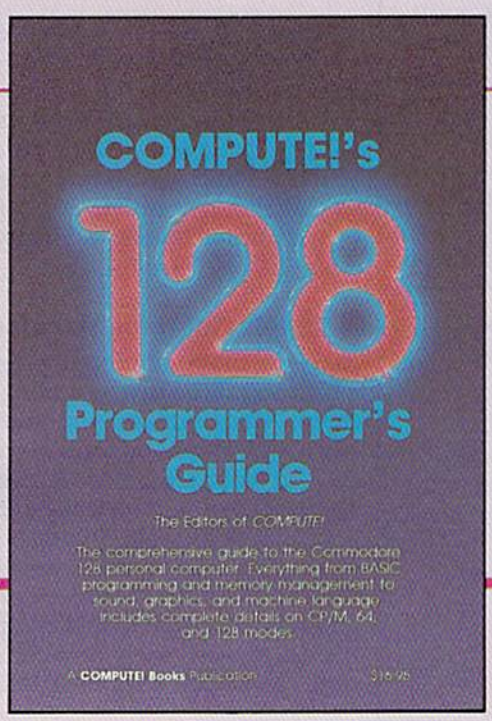
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Line 50 prompts the user to enter the amount spent on food.

Line 60 uses the INPUT# command to accept a second INPUT, called B, again without a question mark. Next, we close our keyboard file and print a blank line (merely for aesthetics).

Lines 70–90 print a blank line, then a final message, which uses the INPUT numbers typed in by the user. As you can see, variables A and B can be added together just like the numbers they represent, and as always, variables are positioned outside quotation marks.

Sending Information To Your Printer

To open the channel to your printer, type OPEN 4,4. The first 4 is the file number and the second 4 is the device number.

To program your printer to print on paper, use the PRINT#4 command, followed by a comma and the information or variables you want the printer to print.

PRINT#4 works like the PRINT command, except that it sends information to your printer instead of to your computer screen.

Here's a quick example:

```
10 PRINT CHR$(147)"PRINT DISPL
   AYS INFORMATION ON THE SCRE
   EN."
20 OPEN 4,4:PRINT#4,"PRINT#4 S
   ENDS INFORMATION TO THE PRI
   NTER.":CLOSE 4
```

Line 10 uses a PRINT command to clear the screen and display a message on the screen.

Line 20 opens file 4 and device 4—the printer. Next, we use PRINT#4 and a comma to send a message to the printer, thus a message is printed on paper. Finally, we close the printer file.

A Simple Subtotal Machine

Here's a more advanced program which acts like a simple adding machine. The numbers you want to add are displayed on the screen and also on your Commodore printer. The totals are automatically entered both places as well. To see how it works, type the program exactly as shown, then run it and enter the numbers you want to add and press RETURN after each number. The result gives you a running total:

```
10 OPEN 4,4
20 PRINT CHR$(147)"SUBTOTAL MA
   CHINE":PRINT:PRINT
30 PRINT"ENTER A NUMBER":PRINT
40 PRINT"ADD";:INPUT A:PRINT#4
   ,"ADD"A
50 PRINT"TOTAL"A+B:PRINT#4,CHR
   $(18)"TOTAL"CHR$(146) A+B
60 B=A+B
70 GOTO 40
```

To break out of this program, which uses the GOTO to loop back to itself, hold down RUN/STOP and press RESTORE at the same time.

Last but not least, if you'd like to save this program on disk, leave the program in your computer's memory, cursor down to a blank line and type the following:

SAVE"SUBTOTAL PROGRAM",8

To bring the program back, type NEW to erase your computer's memory, then type: LOAD"SUBTOTAL PROGRAM",8 and press RETURN.

Next month, we'll take a look at two commands which are often used to create disk-based programs: DATA and READ.

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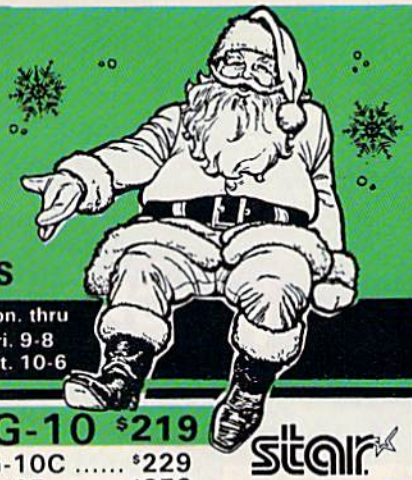

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machine language for beginners

Exploring The 128's Monitor

Richard Mansfield
Senior Editor

Let's take a look this month at a special feature built into the new Commodore 128 which makes life easier for ML programmers. The several early Commodore machines—the PET, 8032, and SuperPet which preceded the VIC and 64—all had a doorway to ML called a *monitor*. Open this door and you go down below BASIC, down into the computer's engine room where you can get close to the microprocessor and the computer's memory.

The VIC and 64 did not come with a monitor (though you can buy add-on monitors or find monitor programs like *Supermon* and *Micromon* in books). Nonetheless, it's nice to have a resident monitor, a permanent, easy passageway into the heart of the machine.

On the 128 you just type MONITOR or press f8 and you're in a different world, with new prompts and new commands. Here's a rundown of the various commands:

- *Compare* takes a look at two separate sections of memory and prints the address of any locations which differ. You might use this to see if two programs differ or to quickly determine which version is the more recent. (Each command is a single letter. Compare, for example, is activated with: C 1000 2000 8000 which prints out differences in memory between 1000–2000 and 8000–9000.)

- *Fill* fills a range of memory with a specific value. It's sometimes used to lay down a zone of zeros in, say, the second cassette buffer, prior to running a commercial program. Then, you can go back and look at the blanket of zeros and quickly see which locations are being used by the commercial program for storage.

- *Go*, like SYS, starts the execution of an ML routine, which should end with a BRK if you want to reenter the monitor.

- *Hunt* is particularly useful for tracking down ROM locations that you might want to use. If, for example, you know that a 64 ROM routine to print out numbers starts with PHA:TAX, you could request a hunt for this pattern of bytes in 128 ROM and find out where to JSR. (H 1000 2000 48 AA would look for PHA:TAX.)

- *Jump*, which is undocumented in the System Guide, performs a JSR to an ML routine. It does the same thing as *Go*, with one exception. If you jump to a routine that ends with RTS, you return to the monitor. But if you Go to the same routine, the RTS sends you back to BASIC.

- *Load* loads a file from tape or disk.

- *Memory* goes through a specified range of memory and prints the numeric *and* character values therein. This can be used both for locating special areas of ROM like the BASIC keywords or for checking that your ML program is working correctly by looking at its buffers, pointers, etc. after a BRK in a running program.

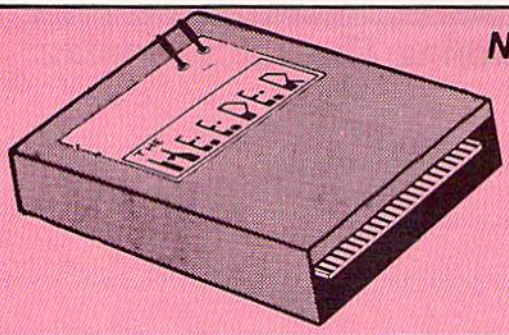
- *Registers* shows you what's currently in the Accumulator, X, and Y registers as well as the program counter (where you were in memory when BRK took effect) and the status register. The registers are automatically printed on screen when you enter the monitor. It's quite useful when debugging to see where you hit a BRK and what's going on with the registers. This is the equivalent of inserting STOP in your BASIC programs and then asking for variable values with ? VARIABLENAME so you can try to locate where things are going awry.

- *Save* is very valuable. You can save any section of memory to disk or tape, even the screen. If you've tried to save machine language programs on the VIC or 64 without a monitor or assembler, you know how useful a built-in ML save command is (S "NAME",08, 1000,2000).

- *Transfer* sounds better than it is. It allows you to move any section of memory to another location. Unfortunately, most ML isn't relocatable (JSR's, etc., still target their old addresses). The best way to relocate ML is to use an efficient assembler where you can simply change the start address and reassemble at the new location.

The monitor also allows you to change the values in the registers (to set up a test); to directly modify the bytes in memory (not too useful unless you're typing in a "hex dump" type listing from a book or magazine); and to directly type in mnemonics (very useful when you want to insert a BRK, NOP, or test values). Possibly the most valuable tool in the monitor is the disassembler. Like BASIC's LIST command, a disassembler will display the fundamental source code of any ML and then you can directly modify it, and test it again. There's also a mini-assembler, but unless you're creating a very short ML routine, it's far better to stick with more effective assemblers.

Some of the facilities of the monitor are more valuable than others, and it would have been nice to have a single-step trace function. But when you're trying to hunt down those elusive bugs in an ML program, there's nothing like having a good, built-in monitor only a function key away. In fact, on some computers the monitor is called, simply, *the debugger*.



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Music Shop	?	105 sec.	105 sec.*	105*	21 sec.
Hitchhiker's Guide to the Galaxy	?	70 sec.	70 sec.*	N.G.**	68 sec.
On-field Football	?	149 sec.	66 sec.	63 sec.	58 sec.
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Heart of Africa

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The legendary tomb is your goal in *Heart of Africa*, a delightful new offering from Electronic Arts. The game is a successor to Ozark Softscape's *Seven Cities of Gold*, and the two share a strong superficial resemblance. Overall game mechanics are similar. In both, the player must traverse territory represented by thousands of screens of scrolling maps. Success is measured by the extent of your discoveries and the wealth you amass, and by your ability to manage your resources and master the logistics involved in exploring vast and dangerous regions.

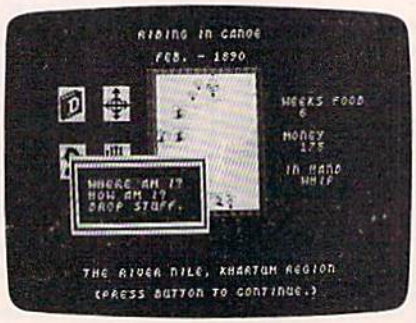
Beyond this, the differences become significant. *Seven Cities of Gold* is a game of conquest and greater scale. Violence against the natives is an indispensable tool, and you have 60 years in which to dominate two uncharted continents and their inhabitants. In real time, it may take 15 hours and several sessions before you and your small army are suitably rewarded by the hypocritical court back home in Europe.

Heart of Africa offers satisfaction on an individual level. It's 1890, about 20 years after Stanley's famous search for Livingstone, when you arrive in Cairo—totally alone, as you will be throughout the game. All you've got to go on are vague rumors about the tomb, and the meagre funds provided for you from Primm's will. And you've only got five years to complete your quest.

During that period, you'll need to cover thousands of miles, meet and talk to numerous different tribes, finance your trip, figure out where the elusive tomb lies, and stride carefully through a continent as rich in peril as it is in mystery. It's a difficult balancing act, made worse by a severe shortage of time. If you fail, you die, lost like Primm himself, a man whose mettle could not match his vision.

In that case, you'll want to play again. Although the African continent remains the same (it's geographically accurate), the locations of the tomb and valuable commodities are shifted for every game, as are messages and clues. Marvellous surprises may spring up at any time, but remember—pestilence, disease, treachery, and disaster will also strike in an equally unexpected manner.

Although it wouldn't be fair to give away too many specifics or details of game strategy, there are some general features of the program that bear mentioning.



Most crucial of all, you must immerse yourself in the native cultures to survive. The ability to resupply depends largely on the friendliness of your relations with the Africans. Dealing diplomatically with the tribes and their various customs and languages is the key to tracking down the legend of Ahnk Ahnk. You'll explore cities and villages, enter buildings, and talk directly with individual natives. And you'll see all this in detailed, close-up graphics. Several geographical aids are available to you, but you must remember to include them in your pack before you set forth. As a further boon to the weary traveller, the computer provides you with a constantly updated diary of events and clues, all described in ornate late-Victorian prose. This record, like the other features, is accessed through joystick control of icons and multiple screen windows. It's fast, flashy, and very easy to use.

As with all Ozark Softscape games, there's a lot of trading involved. In this case, it's more critical than usual because your resources are limited, and you can carry only what will fit into your pack. You're helped a little by the ability to cache supplies anywhere, but hindered severely by the perishability of foodstuffs in the African heat. There are also some strange and terrible afflictions awaiting you, but surely you're not the type to turn back now.

This game is a real pleasure to play, especially when fate turns evil and the only hope is your own fierce resolve to get to the tomb. A full game can be played in about three-and-a-half hours, and it can be saved at just about any point, making it considerably more manageable than its predecessor.

In the end, it is a hopeful game, and certainly not for conquistadors. Violence will avail nothing, except for some suitably sardonic screen messages or possibly your own demise. In a time of very real drought and famine in Africa, it's useful to be reminded of the long history of this great continent. Admirably and entertainingly, *Heart of Africa* also reminds us that the role of the "civilized" explorer need not be one of bloodshed and plunder. This is a game of wonder and discovery.

—Lee Noel, Jr.

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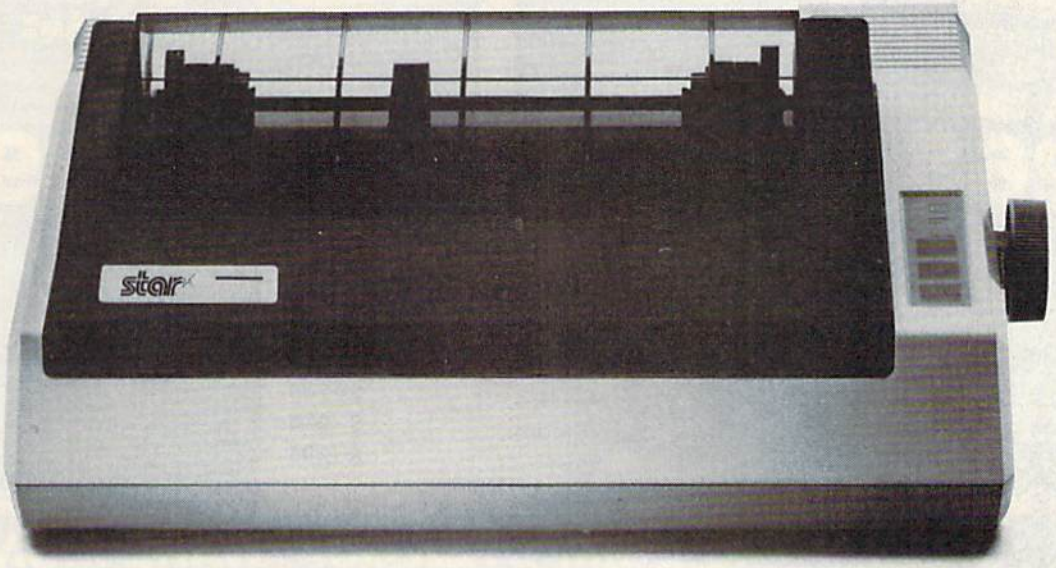

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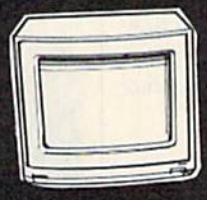

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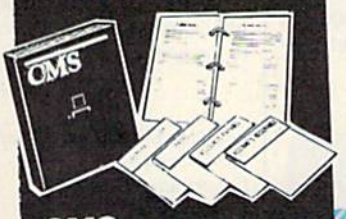

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Fans of baseball will love this software package for the Commodore 64. Play a friend or the computer. Use the joystick to choose the home field advantage and which type of game you'll play. On defense, you can choose your pitcher. Some pitchers have plenty of offspeed stuff, some have plenty of hard stuff, and some have a mixed bag of tricks. They're all good if you know how to work over the batters. Hint: A high earned run average (ERA) doesn't necessarily mean the guy can't get batters out.

Once you start, you can pitch the ball anywhere you like, and your catcher has the inhuman advantage of not allowing passed balls or wild pitches. There is also the option to change other players too, and a high batting average doesn't always mean automatic base hits. Once the ball is hit, the defensive player nearest the ball will begin to blink. That player is the one currently under joystick control. After fielding the ball, throw it to the base or player desired: right and fire button for first, up and fire for second, left and fire for third, or down and fire for home. The copy I reviewed seems to give the defense an advantage, so take your time and get those batters out. On offense you can swing the bat anywhere in the strike zone, inside, outside, high or low. There are also steal and bunt options. Practice hitting the ball with smooth strokes, and soon you'll be knocking the long ball.

This package has practically everything you could want. *Hardball*'s superiority as a baseball simulation is apparent for several reasons. First, previously published baseball software has resigned us to managing or playing. In this game we get to do both. We have the manual skills of fielding, pitching, and batting simulated, and, if things look bleak (or unusually good), we can instantly become Connie Mack and change the players around to our liking. Second, the unusually clear and precise graphics provide an excellent view of the field from two of the best perspectives, right behind the pitcher and high above home plate. A clever divided-screen technique has been implemented to give a more panoramic view of the field. Finally, this package approaches a level of realism unreached by the baseball software I've seen to date. This makes it fun not just the first few times, but over and over again. Like real-life baseball, the variations are endless, and each game is different.

A highly recommended buy for baseball fans, Accolade's *Hardball* is a well-conceived, well-written, and finely constructed piece of software.

—David Florance

Accolade Entertainment Software
20863 Stevens Creek Blvd.
Cupertino, CA 95014
$29.95 (disk)

Silent Service: The Submarine Simulation

A unique blend of action and strategy make Sid Meier's *Silent Service* an exciting game for the Commodore 64. Take command of various classes of World War II submarines and see if you can survive the War in the Pacific.

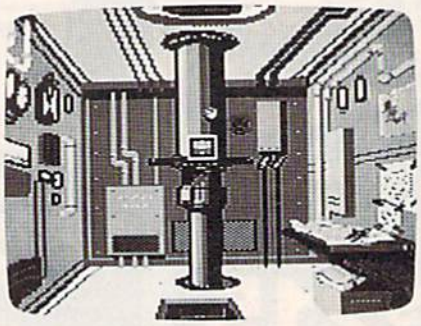
Unlike many other strategy games, you can be playing this one within minutes of starting the program. The instructions are detailed, and the historical simulations are accurate; but you can learn while you play, without having to spend hours just memorizing the rules of the game.

Choose the Torpedo/Gunnery Practice scenerio for a training mission before stepping up to Convoy Actions, realistic simulations of actual submarine attacks on convoys. You'll even have to contend with many of the problems faced by the captains and crews of famous WWII subs.

Once you've mastered the basics, you can change the reality levels of the game. Set up the program for limited visibility, for instance. Or, have the convoy you're tracking take evasive action, make some torpedos duds, and increase the skill level of the enemy destroyer escorts in the convoy. Then after moving in to attack range of a convoy only to be driven off or sunk by an attack of seven or eight destroyers you weren't expecting, read the section of the manual on strategy, and try again.

When you're ready, embark on a War Patrol. Set sail for up to 60 days of adventure on the high seas searching for and destroying convoys.

Numerous screens are available during the game. Your primary battle station is the conning tower, where you can view the radar and sonar plots, use the periscope to direct attacks, view the instrument panels, and receive reports from Damage Control. Use the various charts of the Pacific to plot your course and plan your maneuvers to intercept the elusive enemy convoys.



Sometimes you'll feel absolutely overloaded with information, and the fate of your sub relies on your prompt decision. A wrong choice could send you to the bottom.

Excellent graphics and meticulous attention to detail make *Silent Service* a fascinating diversion you'll return to time and time again.

—George Miller

MicroProse Software
120 Lakefront Dr.
Hunt Valley, MD 21030
$34.95 (disk)

Word Writer 128

Two of the 128's three personalities, the 64 and CP/M modes, have lots of software available. I tried several of my favorite 64 programs, and they worked fine in 64 mode. Likewise, some well-known CP/M programs, designed to be used on Epson and Morrow computers, performed flawlessly. However, the 128 mode seems to be somewhat of an orphan, without much software to exploit its additional memory or other features. In time, this will change, and the 128 mode will have its share of programs. One package, available now, is Timeworks' word processor *Word Writer 128*.

This program is designed to work with the 128 *only* in 128 mode with 80 columns and either a 1541 or 1571 disk drive. It comes on a copy-protected disk. To use 80 columns, you must have a monitor hooked up to the RGB port on the 128. (I got a very sharp display using

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VIZASTAR for the C128

Vizastar, the integrated spreadsheet, database and graphics program that has the Commodore 64 world raving, is now available for the C128. It boasts 80 columns, and has over 40K of free memory in the spreadsheet. Those who already own Vizastar 64 will be pleased to know that your existing files can be read by Vizastar 128. Also, you can upgrade to the 128 version. Call us for details and pricing.

"The only other comparable product would be Lotus 1-2-3 for the IBM PC; nothing in the C64 world comes even close to the features of Vizastar."

AHOY July 85

"I found Vizastar would do anything Lotus 1-2-3 could, and then some. It's my Commodore choice to become the standard against which the others will be judged."

INFO 64 Magazine, Issue #7

"Vizastar is an exceptional package that rivals the features of programs such as Lotus 1-2-3 and offers C64 owners the kind of integrated software previously only available for higher-priced systems."

RUN Magazine, June 1985

"I scrutinized, tested and experimented with Vizastar extensively, but could find no weaknesses whatsoever. It is the most comprehensive, most flexible, most powerful and easiest to use integrated software package I've worked with."

Commodore Microcomputer, Sept/Oct 1985

"I use an IBM PC at work with Lotus 123. I feel Vizastar is just as good and in someways better than 1-2-3."

Steven Roberson, NC. End User

"I have used Multiplan and Superbase; both are good pieces of software, but are inadequate when compared to Vizastar."

Jim Mathews, WA. End User

"So good, I bought a second C64 and Vizastar for my office. A wild bargain! You've saved me from having to buy IBM and Lotus."

Philip Ressler, MA. End User

VIZAWRITE CLASSIC for C128

This is the new word processor from Vizastar's author, Kelvin Lacy and is the successor to Omniwriter, which he also wrote. All the features of Omniwriter are there, plus many significant enhancements, like auto pagination, on-line help, pull-down menus, full-function calculator and more. Up to 8 'newspaper-style' variable-width columns can help with newsletters.

Three different proportionally-spaced "near letter quality" fonts are also built-in for use with Commodore or Epson compatible printers. You can merge almost any other word processor file directly into Vizawrite, including Paper Clip and Omniwriter. Naturally, it is also compatible with Vizastar. At all times, what you see on the screen is exactly the way it will be printed out. Vizawrite can do mail-merges and has an integrated 30,000 word spelling checker that you can expand yourself.

PROGRAM SPECIFICATIONS

Both Vizawrite and Vizastar are written in 100% machine language and run in the 128's FAST mode, making it lightning fast. They require a C128 with 80 column color or monochrome monitor. Both come with a cartridge, a diskette, a backup, and a reference manual. Vizastar also includes a 50 page tutorial book. Both work with 1541 or 1571 disk drives.

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Vizastar 128 is priced at **$119.97.** Vizawrite's price is **$79.97.** Vizastar 64 XL8 is now available for **$119.97.** We are so positive you will be satisfied with our programs that we offer a 15-day money-back guarantee. Try it Risk-Free. Call us today or send a check or money order. VISA/MC accepted.

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Commodore 64/Commodore Electronics Ltd. Multiplan/Microsoft

an 80-column monochrome monitor and a homemade cable.)

I tried the program right out of the box with only a peek or two at the manual. Immediately I was able to write a short letter which was mailed the next day—and it used only a small fraction of the 64K available for document storage. Any problems—if, indeed they were that—were due to my being used to another word processor. A novice user will love *Word Writer 128*, as many of the program options are described by pull-down menus (à la Macintosh), diminishing the need for constant reference to the manual.

Word Writer offers many of the options of "full-featured" word processors: move and copy text, search and replace, insert and delete, word wrap and format, indent and tab, page numbering, chaining, centering, form letters, and merges.

Other notable features include an 85,000-word spelling checker, a built-in calculator (with results you can insert in your text), utility programs (single disk copier and file converter), printer configuration programs (which work with most popular printers), and technical support from a toll-free hot line. *Word Writer* is also integrated with Timeworks' *Data Manager 128* and *SwiftCalc 128*.

For the most part, I have no hesitation in recommending this program. A beginner will appreciate its easy-to-learn format, and it does most of the things you'd expect a good word processor to do. However, *Word Writer* seems to be an odd mixture of a pre- and post-formatting word processor. The format command does not leave you with exactly what you get on the printed page. Furthermore, the command even formats *after* carriage returns, so lists can appear askew unless you disable this feature around the list.

There are some features found on more expensive word processors not included with *Word Writer*: headers, footers, and the ability to alphabetize lists or calculate numbers in columns or rows. It does, however, include all the standard features, and more, of the most popular word processors. (And the pull-down menus are a real bonus.)

If you're looking for dedicated 128 software, take a good look at this program. You can't go wrong—Timeworks will buy you another program if you find a better one in 90 days, an unusual and commendable offer.

—Harvey Herman

Timeworks, Inc.
444 Lake Cook Road
Deerfield, IL 60015
$69.95

Super Huey

Aircraft simulations have become one of the most popular kinds of computer games available. They're sometimes realistic enough to make you feel you're actually flying. Now, Cosmi has introduced one of the first helicopter simulators for the Commodore 64. The game is *Super Huey*, and it puts you behind the controls of the Huey UH-1X, an experimental high performance aircraft.

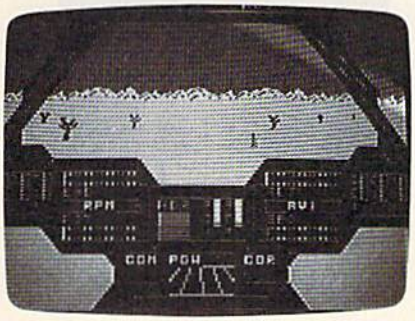
You start at your own airbase, then select from one of four missions: Flight Instruction, Exploration, Rescue, or Combat. You select your option by entering three-letter codes into your onboard computer.

Flight Instruction mode— By following the instructions on your helicopter computer screen, you control everything from engaging the engines to flying around your territory. You are in total control of the aircraft, but the computer leads you through take-off and flight via instructions on your helicopter computer screen.

Exploration mode—Your task is to map out the general terrain and uncharted territory to find major geological features and other significant landmarks.

Rescue mode—Military personnel are lost in a mountainous region. You try to locate them, and, if possible, pick up the injured and return to the base.

Combat mode—There is a secret desert installation that could be a security threat. You're to determine the enemy's ground and air strength to decide if attack engagement is feasible. You'll battle tanks and helicopters using your aircraft's rockets and machine guns.



After you've selected one of these modes, enter POW (power) into the computer. The screen gives a view from the cockpit, including front window, two side windows, and two floor windows to the sides of your feet. Instruments are displayed both in front of you and on the ceiling of the chopper. There are 29 instruments: everything from a magnetic compass and artificial horizon to malfunction lights and direction finders. This setup of helicopter instruments and screens is the best I've seen, and makes excellent use of the 64's great graphics capabilities.

Control is exercised by joystick and typed three-letter codes to the computer. Moving the joystick and pressing the fire button maneuvers the helicopter. This is a little difficult in combat when the fire button can either launch missiles or fire machine guns (whichever are currently in use). So it's not possible to fire and move at the same time. It would have been helpful to have available another key for firing, but this is only a problem in combat mode. The chopper's computer is also important since it controls over 20 different functions. The manual provides good documentation and contains brief explanations of conventional helicopter controls and the theory of autorotative landing.

—Reed Huish

COSMI
415 North Figueroa St.
Wilmington, CA 90744
$19.95 (disk)

also worth noting

Panzer Grenadier

You command a regiment of the elite Grossdeutschland panzer grenadier division as it battles its way across the steppes, rivers, woods, and cities of Russia in SSI's newest World War II combat simulation. Designed by Roger Damon, the creator of *Fields of Fire*, this one-player game, available for the Commodore 64, shares much of the same mechanics and game flavor. Moving and firing your motorized infantry, tanks, mortars, artillery, and combat engineers is as easy as moving the joystick and pressing the firebutton. Several game phases let you observe the battlefield, fire your weapons, and move your troops. Enemy reactions, all computer-controlled, are interspersed with your decisions.

Five scenarios, from gaining and defending a bridgehead to defending a city against a massive Soviet counterattack, provide a variety of combat problems. Deciding how and where to attack—or defend—can mean victory or annihilation.

Your forces fight with real capabilities. Tiger tanks pack a devastating punch, but are slow and ungainly in a fluid battle. Infantry can assault enemy armor, but at a terrible cost. Pinning down the Russian units, whether you're advancing or holding fast, is vital. Ignore the enemy and his fire can throw your regiment into disarray.

Panzer Grenadier is a fast-paced recreation of combined arms combat in the Second World War. Game play is easy to learn and the action is nonstop. It's all here for the armchair general.

Strategic Simulations, Inc.
883 Stierlin Rd., Building A-200
Mountain View, CA 94043
$39.95

The Fourth Protocol

The fate of the free world is in your hands. A British traitor is helping to carry out a Soviet plan to explode a nuclear bomb in Great Britain—and blame it on the Americans. As intelligence agent John Preston, you've got to unravel a trio of deadly puzzles before the plan can be implemented.

Based on the book of the same name by popular author Frederick Forsyth, *The Fourth Protocol* offers Commodore 64 game players a complex and intriguing race against time. The game uses a system of icon-based graphics which help you ferret out secret documents from NATO files and then move about London seeking the nuclear device. The final episode is text-based and requires you to defuse the bomb itself using information you've gathered earlier in the game. *The Fourth Protocol* is no simple game. You'll have to break codes, sift clues, read maps, and judge good information from bad. Even if you've read the book, there are plot twists that make this a challenging contest.

Bantam Electronic Publishing
666 Fifth Ave.
New York, NY 10103
$34.95

The Dolphin's Rune: A Poetic Odyssey

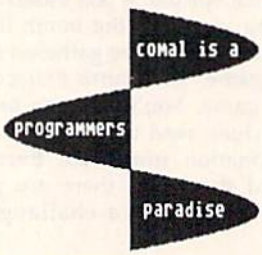
An undersea world of poetry and mystery awaits the player of *The Dolphin's Rune*, Mindscape's new adventure, available for the Commodore 64. The player controls a dolphin who glides through a colorful sea in a quest for poetry fragments. Sound easy? Far from it. The poetry fragments are cryptically encoded in hieroglyphics and lie in a sea bed, which can only be reached

Advertisement

Easy Curves

1) Insert your COMAL disk in drive*.
2) Type LOAD "C64 COMAL*",8
3) Type RUN (starts COMAL)
4) Type AUTO (turn on auto line#'s)
5) Enter the program lines shown below (COMAL indents lines for you)
6) Hit RETURN key twice when done
7) Type RUN

```
0010 setup
0020 curve
0030 paint'it
0040 add'words
0050 //
0060 proc setup
0070    black:=0; yellow:=7
0080    background black
0090    pencolor yellow
0100    setgraphic 0 //hi res screen
0110    hideturtle
0120 endproc setup
0130 //
0140 proc curve
0150    moveto 110,0
0160    drawto 110,199
0170    for row:=0 to 10 step .03 do
0180      drawto 110+99*sin(row),row*20
0190    endfor row
0200 endproc curve
0210 //
0220 proc paint'it
0230    fill 120,20
0240    fill 100,90
0250    fill 120,180
0260    fill 100,198
0270 endproc paint'it
0280 //
0290 proc add'words
0300    pencolor black
0310    background yellow
0320    plottext 120,155,"comal is a"
0330    plottext 16,90,"programmers"
0340    plottext 120,30,"paradise"
0350 endproc add'words
```

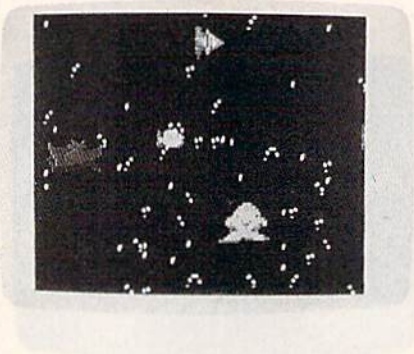


Notice how easy graphics are in COMAL. Lines 70-100 set up the screen colors. Lines 150-190 draw on the screen. Lines 230-260 fill (paint) whole parts. Even putting text on the graphic screen is easy. See lines 320-340. All this is standard and built in as part of COMAL. Plus a full turtle graphics system. Now you know why there are 100,000 users.

* If you don't have COMAL yet, order a Programmer's Paradise Package-$19.95. It includes the complete COMAL system plus over 400 pages of information. Add $5 more to get our 20 interactive lesson Tutorial Disk. Add $2 shipping. Visa/MC or US funds check accepted. Send to:

COMAL Users Group USA
6041 Monona Drive, Room 104
Madison, WI 53716
phone 608-222-4432

after the dolphin has had a vision; visions come only after entering and negotiating an elusive color current. Meanwhile, the dolphin must surface periodically for air, avoiding sharks and tuna nets along the way. For those with a lot of patience and a knack for cryptography, *The Dolphin's Rune* offers an aesthetic and challenging adventure.



Mindscape
3444 Dundee Rd.
Northbrook, IL 60062
$29.95

Ballblazer

Are you resourceful and quick enough to be a Masterblazer, skimming your Rotofoil across the playing grid as you push another Plasmorb toward the goal? That's the essence of *Ballblazer* from Epyx, now available for the Commodore 64. Originally created more than a year and a half ago by Lucasfilm Games Division for Atari computers, the translation to the 64 is every bit as good as the original.

Ballblazer offers a split-screen playing field that shows a first-person view as you go head to head with another player or with the computer. The object of the game is for you to capture the ball (Plasmorb) in the magnetic field surrounding your Rotofoil car and then score goals by pushing or shooting the Plasmorb through a goal at the end of the field. Simultaneously, your opponent is trying to steal the Plasmorb with his Rotofoil.

Everything, from the music and graphics to the game play itself, is first rate. *Ballblazer* has been a long time in coming for the 64, but the wait was worth it.

Epyx Computer Software
1043 Kiel Court
Sunnyvale, CA 94089
Suggested retail approximately $30–40

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Snapshot

Clayton R. Newman

This clever utility can store up to 56 different screens in memory and instantly retrieve any one for display. For the Commodore 64 and 128 (in 64 mode).

Here's a program that can be a real boon to programmers. "Snapshot" is a machine language utility that stores whatever you have on the text screen, including colors, into the unused RAM which underlies BASIC. It can store and retrieve up to 56 screens. And you can save the screens to tape or disk. It crunches the information for the screen, storing up to 255 empty spaces or repeated characters in only three bytes.

Since Snapshot is written entirely in machine language, it works fast. It can print a screen more than twice as fast as the equivalent BASIC PRINT statements, and far faster than POKEing data to screen memory.

Two Modes

"MLX," the machine language entry program (found elsewhere in this issue), is required to type in Snapshot. After loading and running MLX, answer the prompts for the starting and ending addresses with C124 and C983, respectively. After typing it in, save a copy.

Snapshot can be used in either program or immediate mode. The commands are slightly different in each mode. (See the accompanying table for a list of commands.) Immediate mode uses the CONTROL key to input commands. In program mode, several SYS commands are required.

To use it in immediate mode, load Snapshot by typing LOAD "*filename*",8,1 (disk) or LOAD "*filename*",1,1 (tape), then NEW and SYS 49444. Then, create or display the screen you want copied. When the screen is ready, press CONTROL-C. Snapshot copies the screen to memory and asks you for a screen name. All Snapshot screen names must be two characters long. Any two characters, except asterisks, may be used. If you choose a name that's already been used, the old screen will be replaced by the new one. Use the INST/DEL key to make corrections when entering the name. If you decide not to save the screen at all, just press RETURN with no name and it will cancel the command. This escape works with all commands.

To recall a screen, press CONTROL-P and enter the two-character screen name. CONTROL-I displays an index or directory of your screen names. To delete a screen, press CONTROL-D and enter the name. To delete all of your screens, enter an asterisk (*) as your screen name. (Individual screen names should not contain an asterisk.)

CONTROL-S and CONTROL-L are used to save and load the entire group of screens on tape or disk. You're asked for a filename—for the entire group of screens—and whether you're using tape or disk. (Tape users: you must enter a filename, since pressing RETURN with no input aborts the command.)

If you wish, you can copy only part of the screen. To do this, position the cursor at the start of the section you want to save and press CONTROL-F. The cursor changes color. Now move the cursor to the position after the last character you want saved and press RETURN. When these fractional copies are printed, they're returned to the screen in the same location from which they were saved.

If you're working with graphics, you may often want to change the screen location or redefine the character set. Snapshot will work in either case, but remember that screens are printed to the same screen location from which they were originally copied. You could set up several screens ahead of time and scroll through them by changing screen locations. But remember that all screen locations use the same color memory, so if the screen being printed has different colored characters than the screen currently displayed, the colors on the current screen will change too.

The program mode commands are very similar to immediate mode. The format is SYS 51000, *command, name*. For example, to print a screen named AB, use SYS 51000,P,AB (P is for Print). You can use a string variable for the screen name, as in SYS 51000,C,A$. Array variables cannot be used, so if you want an array of screen names you must assign the array variable to a regular string variable: A$=B$(20). For loading or saving, add T (tape) or D (disk): SYS 51000,S,*filename*,D. Do not use quotes for the filename. Also, you don't need to SYS 49444 (the command that activates Snapshot) in program mode.

Making It Useful

Snapshot has numerous applications. One is displaying backgrounds for arcade games or text adventures. By using a redefined character set, very complex screens can be drawn, rivaling high-resolution screens. Many commercial games use screens drawn this

way. One advantage of Snapshot is that it uses a maximum of 1509 bytes to store a screen while a high-res screen uses 9000 bytes. Another use for Snapshot is for menus, instructions, and title screens.

Snapshot is transparent to most BASIC programs. This means you can use it in immediate mode to copy screens of programs while they're running.

Snapshot saves the screens in RAM underneath the BASIC ROM at 40960–49151, providing 8192 bytes of storage, enough to store six screens using the maximum size of 1509 bytes per screen. The minimum size for a whole screen is 27 bytes. There is enough room for 327 screens this size, but Snapshot can only handle up to 56 screens at a time.

The reason that different screens require different amounts of memory is that Snapshot compresses the screen as it is saved. Any screen character repeated three times or more is represented as the character code along with a count of how many repeats. Color memory works the same way; however, since 16 colors can be represented in half a byte, two color locations are crunched into each byte to save space. This means that a screen which is mostly empty space, repeated characters, or the same color, uses much less space than a screen with a complex image.

If you run out of memory, Snapshot will display an error message. You can extend your Snapshot memory by lowering the top-of-BASIC pointer in locations 55 and 56. Type POKE 56,PEEK (56)−4*X:CLR where X is the number of kilobytes of added memory.

When Snapshot prints a screen, it also changes the background and border colors to those that were saved. If you use extended background color mode, it will print the extra background colors. It also saves the extra colors for multicolor characters. Sometimes, however, you might not want these changes. To disable this feature, POKE 50620,1. To reenable it POKE 50620,0.

Program 2 demonstrates a little of what Snapshot can do. The program sets up the screen, and then Snapshot quickly displays several screens, simulating animation.

See program listings on page 119.

Snapshot Commands

Command	Immediate mode	Program mode
Copy	CONTROL-C	SYS 51000,C,screen name
Print	CONTROL-P	SYS 51000,P,screen name
Delete	CONTROL-D	SYS 51000,D,screen name
Copy fraction	CONTROL-F	not available
Index	CONTROL-I	SYS 51000,I
Load	CONTROL-L	SYS 51000,L,filename,D (or T)
Save	CONTROL-S	SYS 51000,S,filename,D (or T)

Disable changing special color registers: POKE 50620,1
Reenable: POKE 50620,0

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Commodore 128 Memory Map

Important Locations

Jim Butterfield

Here's an abridged memory map that shows key locations of the Commodore 128 in 128 mode. Included are decimal and hexadecimal addresses, and brief descriptions of the functions of each location.

This memory map applies to the Commodore 128 when used in the 128 mode. In 64 mode, the machine's map is identical to that of the Commodore 64.

There are 28 pages (256 bytes each) of overhead before the start of BASIC. The following list shows some of the more important locations.

Architecture

"Bank numbers" as used in the BASIC BANK command and the built-in machine language monitor's addressing scheme are misleading; in fact, they're more correctly called "configuration numbers." Bank 0 shows RAM level 0, which contains work areas and the user's BASIC program. Bank 1 also shows RAM, this time (for addresses above hexadecimal $0400) level 1, which contains variables, arrays, and strings. Other "banks" are really configurations, with various types of ROM or I/O overlaying RAM. Thus, bank 15 (the most popular) is ROM and I/O covering RAM bank 0. Bank 14, however, is ROM and the character generator overlaying RAM bank 0. Architecture is set so that addresses below $0400 reference bank 0 only. Other bank switching (more complex than the simplified 16-bank concept) is accomplished via storing a mask to address $FF00, or calling up prestored masks by writing to $FF01–FF04.

Memory Map

Hex	Decimal	Description
All Banks:		
0000–0001	0–1	I/O port, similar to 64
000F	15	Type: FF=string; 00=numeric
0010	16	Type: 80=integer; 00=floating point
0015	21	Current I/O prompt flag
0016–0017	22–23	Integer value
002D–002E	45–46	Pointer: start-of-BASIC (for bank 0)
002F–0030	47–48	Pointer: start-of-variables (bank 1)
0031–0032	49–50	Pointer: start-of-arrays
0033–0034	51–52	Pointer: end-of-arrays
0035–0036	53–54	Pointer: string-storage (moving down)
0039–003A	57–58	Pointer: limit-of-memory (bank 1)
003B–003C	59–60	Current BASIC line number
003D–003E	61–62	Textpointer: BASIC work pointer
0041–0042	65–66	Current DATA line number
0043–0044	67–68	Current DATA address
0047–0048	71–72	Current variable name

0049–004A	73–74	Current variable address
0063	99	Accum#1: exponent
0064–0067	100–103	Accum#1: mantissa
0068	104	Accum#1: sign
006A–006F	106–111	Accum#2: exponent, and so on
0070	112	Sign comparison, Acc#1 versus #2
0071	113	Accum#1 low-order (rounding)
007D–007E	125–126	BASIC pseudo-stack pointer
0090	144	Status word ST
0091	145	Keyswitch IA: STOP and RVS flags
0098	152	How many open files
0099	153	Input device, normally 0
009A	154	Output CMD device, normally 3
009D	157	I/O messages: 192=all, 64=errors, 0=nil
00A0–00A2	160–162	Jiffy Clock high/medium/low
00AE–00AF	174–175	Tape end adds/End of program
00B7	183	Number of characters in filename
00B8	184	Current logical file
00B9	185	Current secondary address
00BA	186	Current device
00BB–00BC	187–188	Pointer to filename
00C0	192	Tape motor interlock
00C8–00CB	200–203	RS-232 input/output buffer addresses
00CC–00CD	204–205	Keyboard decode pointer (bank 15)
00D0	208	Number of characters in keyboard buffer
00D1	209	Number of programmed characters waiting
00D3	211	Key shift flag: 0=no shift
00D5	213	Last key code: 88 if no key
00D6	214	Input from screen/ from keyboard
00D7	215	40/80 columns: 0=40 columns
00D9	217	Character base: 0=ROM, 4=RAM
00E0–00E1	224–225	Pointer to screen line/cursor
00E2–00E3	226–227	Color line pointer
00E4–00E7	228–231	Screen margins: bottom, top, left, right
00E8–00E9	232–233	Input cursor log (row, column)
00EB	235	Position of cursor on screen line
00EC	236	Row where cursor lives
00FA–00FF	250–255	UNUSED
0100–01FF	256–511	Processor stack area
0100–013E	256–318	Tape error log
0100–0124	256–292	DOS work area
0125–0138	293–312	PRINT USING work area
0200–02A0	512–672	BASIC input buffer
02A2–02AE	674–686	Bank PEEK subroutine
02AF–02BD	687–701	Bank POKE subroutine
02BE–02CC	702–716	Bank compare subroutine
02CD–02E2	717–738	JSR to another bank
02E3–02FB	739–763	JMP to another bank
02FC–02FD	764–765	Function execute hook
0300–0311	768–785	BASIC links
0312–0313	786–787	Unused
0314–0315	788–789	IRQ vector
0316–0317	790–791	Break interrupt vector
0318–0319	792–793	NMI interrupt vector
031A–032D	794–813	Kernal vectors
032E–033D	814–829	Kernal links
033E–0349	830–841	Keyboard matrix shift vectors
034A–0353	842–851	Keyboard buffer
0354–035D	852–861	Tab stop bits
035E–0361	862–865	Line wrap bits
0362–036B	866–875	Logical file table
036C–0375	876–885	Device number table
0376–037E	886–895	Secondary address table
0380–039E	896–926	CHRGET subroutine
0386	902	CHRGOT entry
039F–03D1	927–938	Subroutines to fetch from RAM banks
03DF	991	Accum#1: Overflow
FF00	65280	MMU configuration register
FF01–FF04	65281–65284	MMU load configuration registers
Bank 0 (BASIC programs):		
0400–07E7	1024–2023	40-column screen memory
07F8–07FF	2040–2047	Sprite identity area (text)
0800–09FF	2048–2559	BASIC pseudo-stack
0A00–0A01	2560–2561	Vector: BASIC restart
0A05–0A06	2565–2566	Bottom-of-memory pointer
0A07–0A08	2562–2563	Top-of-memory pointer
0A18	2584	RS-232 receive pointer
0A19	2585	RS-232 input pointer
0A1A	2586	RS-232 transmit pointer
0A1B	2587	RS-232 send pointer

0A20	2592	Keyboard buffer size
0A22	2594	Key repeat: 128=all, 64=none
0B00–0BBF	2816–3007	Cassette buffer, also used by disk auto-boot programs (CP/M or otherwise)
0C00–0DFF	3072–3583	RS-232 input, output buffers
0E00–0FFF	3584–4095	System sprites (56–63)
1000–10FF	4096–4351	Programmed key lengths and definitions
117A–117B	4474–4475	Float-fixed vector
117C–117D	4476–4477	Fixed-float vector
11E9–11EA	4585–4586	Light pen values, X and Y
1200–1201	4608–4609	Previous BASIC line number
1202–1203	4610–4611	Pointer: BASIC statement for CONT
1204–1207	4612–4615	PRINT USING characters (,.$)
1208	4616	Error type ER
1209–120A	4617–4618	Error line number EL
1210–1211	4624–4625	End of BASIC (Bank 0)
1212–1213	4626–4627	BASIC program limit [FF00]
1218–121A	4632–4634	USR program jump
121B–121F	4635–4639	RND seed value
2000–3FFF	8192–16383	Screen memory (hi-res)
4000–FBFF	16384–64511	BASIC RAM memory (hi-res)
Bank 1 (BASIC variables):		
0400–FBFF	1024–64511	BASIC variables, arrays, strings
Bank 14 Same as Bank 15, below, except:		
D000–DFFF	53248–57343	Character generator ROM
Bank 15 :		
4000–CFFF	16384–53247	ROM: BASIC
D000–D030	53248–53296	40-column video chip 8564
D400–D41C	54272–54300	SID sound chip 6581
D500–D50A	54528–54538	MMU 8722 memory setup registers
D600–D601	54784–54785	80-column video chip 8563
	R18–19	Video address, low/high
	R31	Video data, read/write
D800–D8E7	55296–56295	Color nybbles (40 column)
DC00–DC0F	56320–56336	CIA 1 (IRQ) 6526
DD00–DD0F	56576–56591	CIA 2 (NMI) 6526
DF00–DF0A	57088–57098	DMA controller
E000–FEFF	57344–65279	ROM: Kernal
FF05–FFFF	65285–65535	ROM: Transfer, Jump Table

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C64 Repair 39.95*
1541 Repair 79.95*
1541 Alignment only 29.95*
Power Supplies . 32.95
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* Includes parts, labor & UPS return shipping. Air Freight add $10.00.

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$3 EACH!!!

WHY PAY MORE FOR QUALITY PROGRAMS?

The Commodore Software Association is a world-wide software organization specializing in the distribution of owner/user written software for the Commodore 64 and Commodore 128 computers. We are the lowest cost organization specializing in software for the Commodore 64 and 128 in the world!

COMMODORE SOFTWARE ASSOCIATION

Members may purchase any program from our Commodore 64/128 software catalog for Only $3.00 per program — no tricks, no gimmicks. Programs are on diskette. There are no additional charges, the price of $3.00 per program includes postage, handling and all applicable taxes.

How can you sell programs for only $3 each?
The name of the game in cutting costs is volume. Volume of membership (in the tens of thousands) and purchasing (also in the thousands). We also lower our costs with the wide range of programs we offer.

$3 programs? Are they really quality programs?
Any program submitted to us has to meet our high standards. We reject any program that does not meet high industry standards of quality and sophistication.

How many programs are available?
We currently have more than **1000** programs in our Commodore software library. Most are in our up-to-date Commodore catalog. The list grows daily as submissions pour in from around the world. Members will receive regular catalog expansions.

Programs are categorized as follows:
GAMES, MUSIC, EDUCATIONAL,
BUSINESS/FINANCIAL, HOME/PERSONAL,
TECHNICAL.

How do I get a list of programs?
Membership entitles you to our extensive software catalog with listings categorized by type of program.

What else does membership provide?
Membership entitles you to our newsletter REMarks. It contains hints, program reviews, problem solvers and tips that make using your Commodore easier and simpler, and expand its capability.

Do I have to be a programmer to benefit?
Not at all. However, if you do program and want to submit a program to our software library, we have a generous software submission system.

What does it cost to join?
Only a low membership fee of $15 per year. That entitles you to our newsletter, plus all the benefits mentioned above, and quality programs for only $3 each. What's more, we'll mail out membership materials the very same day that we receive your membership fee!

HERE ARE A FEW SAMPLE TITLES FROM OUR SOFTWARE CATALOG:

Motocross, Meteor, Star Flight, Space Patrol, Eliza, Exterminator, Boxing, Battleground, Checkers, Backgammon, Poker, Space Patrol, Helicopter Rescue, Concentration, French Tennis, Alien Ambush, Rear Assault, Vicious Circle, Freeway Fox, Shark Hunt, Moon Base, Star Trek, Trench, Mystery, Candyland, Towers of Doom, Blackjack, Keno, Kizmet, Metrics, Math Tutor, Chemistry, Physics, Spanish, Planet Facts, Super Fly, Fireball, Preschool Learning Aids, European Geography, Trivia Quiz, Credit Card Management, Calorie Calculator, Recipe File, Auto Expenses, Garden Help, Golf Handicapping, Weather Forecaster, Football Rating, Autocypher, Basketball Statistian, Home Inventory, Loan Amortization, Phone/Address List, Financial Math, Depreciation Schedule, Stock Trends, Bonds, Handicapper, Personal Banker, Mortgage Spreadsheet, Letter Writer, Budget Management, W-2 Form, 1040 Form, Annuities, Paycheck, Regression, Bowling Records, Sectional Properties, Equations, Convensions, Chi-Square, Crossover Network, Digital Logic Simulator, Factorial, Flow Chart, Filter Design, Electronic Solution, Bisection, Simpson Integration, Polyhedra Coordinates, Statistical Analysis, etc., etc., etc.

— A very small list when compared to our catalog!

MEMBERSHIP . . . $15.00

I have enclosed a check or money order for $15.00. This entitles me to your newsletter, your extensive software catalog and programs for only $3.00 each.

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P.O. BOX 83655
LOS ANGELES, CA 90083

COMMODORE 64 COMPUTER

(Order Now)

$139.95

- C128 Disks 79¢ ea.*
- Commodore Graphics Printer $99.95
- 13" Zenith Color Monitor $149.95

CALL BEFORE YOU ORDER

COMMODORE 64 SYSTEM SALE

Deal 1	Deal 2
Commodore 64	Commodore 64
Com. 1541 Disk Drive	Com. 1541 Disk Drive
Com. 803 Printer	13" Zenith Color Monitor
$407	$457

PLUS FREE $49.95 Oil Barons Adventure Program

C128 COMMODORE COMPUTER

NEW

(Order Now)

$289.95

- 340K 1571 Disk Drive $259.00
- Voice Synthesizer $39.95
- 12" Amber Monitor $59.95

PRICES MAY BE LOWER

COMMODORE 64 COMPUTER $139.95

You pay only $139.95 when you order the powerful 84K COMMODORE 64 COMPUTER! LESS the value of the SPECIAL SOFTWARE DISCOUNT COUPON we pack with your computer that allows you to SAVE OVER $250 off software sale prices!! With only $100 of savings applied, your net computer cost is $39.95!!

* C128 DOUBLE SIDED DISKS 79¢ EA.

Get these 5¼" Double Sided Floppy Disks specially designed for the Commodore 128 Computer (1571 Disk Drive). 100% Certified, ***Lifetime Warranty***. Automatic Lint Cleaning Liner included. 1 Box of 10 - $9.90 (99¢ ea.), 5 Boxes of 10 - $44.50 (89¢ ea.), 10 Boxes of 10 - $79.00 (79¢ ea.).

13" ZENITH COLOR MONITOR $149.95

You pay only $149.95 when you order this 13" ZENITH COLOR MONITOR. LESS the value of the SPECIAL SOFTWARE DISCOUNT COUPON we pack with your monitor that allows you to save over $250 off software sale prices!! With only $100 of savings applied, your net color monitor cost is only $49.95. (16 Colors).

80 COLUMN COMMODORE GRAPHICS PRINTER $99.95

You pay only $99.95 when you order the 803 Commodore Graphics Printer, 60 CPS, Dot Matrix, Bi-Directional, Prints 8½" full size paper. Plug in direct interface included! LESS the value of the SPECIAL SOFTWARE DISCOUNT COUPON we pack with your printer that allows you to SAVE OVER $250 off software sale prices!! With only $100 of savings applied your net printer cost is ZERO!

4 SLOT EXPANDER & 80 COLUMN BOARD $59.95

Now you program 80 COLUMNS on the screen at one time! Converts your Commodore 64 to 80 COLUMNS when you plug in the 80 COLUMN EXPANSION BOARD!! PLUS 4 slot expander!

80 COLUMNS IN COLOR PAPERBACK WRITER 64 WORD PROCESSOR $39.95

This PAPERBACK WRITER 64 WORD PROCESSOR is the finest available for the COMMODORE 64 computer! The ULTIMATE FOR PROFESSIONAL Word Processing. DISPLAYS 40 or 80 COLUMNS IN COLOR or black and white! Simple to operate, powerful text editing, complete cursor and insert/delete key controls line and paragraph insertion, automatic deletion, centering, margin settings and output to all printers! List $99.00. **SALE $39.95**. Coupon $29.95.

SPECIAL SOFTWARE COUPON

We pack a SPECIAL SOFTWARE DISCOUNT COUPON with every COMMODORE 64 COMPUTER, DISK DRIVE, PRINTER, or MONITOR we sell! This coupon allows you to SAVE OVER $250 OFF SALE PRICES!!

(Examples)

PROFESSIONAL SOFTWARE COMMODORE 64

Name	List	Sale	Coupon
Paperback Writer 64	$99.00	$39.95	$29.95
Paperback Database 64	$69.00	$34.95	$24.95
Paperback Dictionary	$24.95	$14.95	$10.00
The Print Shop	$44.95	$27.95	$26.95
Halley's Project	$39.95	$25.95	$24.95
Practicalc (spread sheet)	$59.95	$19.95	$14.95
Programmers Reference Guide	$24.95	$16.95	$12.50
Nine Princes in Amber	$32.95	$24.95	$21.95
Super Bowl Sunday	$30.00	$19.95	$17.95
Flip & File Disk Filer	$24.95	$14.95	$12.95
Deluxe Tape Cassete (plus FREE game)	$89.00	$44.95	$34.95
Pro Joystick	$19.95	$12.95	$10.00
Computer Care Kit	$44.95	$29.95	$24.95
Dust Cover	$ 8.95	$ 6.95	$ 4.60
Injured Engine	$39.95	$27.95	$24.95
Pitstop II (Epyx)	$39.95	$22.95	$19.95
Music Calc	$59.95	$14.95	$12.95
File Writer (by Codewriter)	$39.95	$29.95	$24.95

(See over 100 coupon items in our catalog)

Write or call for Sample SPECIAL SOFTWARE COUPON!

ATTENTION Computer Clubs

We Offer Big Volume Discounts

CALL TODAY!

PROTECTO WARRANTY

All Protecto's products carry a minimum 90 day warranty. If anything fails within 90 days from the date of purchase, simply send your product to us via United Parcel Service prepaid. We will IMMEDIATELY send you a replacement at no charge via United Parcel Service prepaid. This warranty proves once again that ***We Love Our Customers.***

C128 COMMODORE COMPUTER $289.95

We expect a limited supply for Christmas. We will ship on a first order basis. This all-new revolutionary 128K computer uses all Commodore 64 software and accessories plus all CPM programs formatted for the disk drive.
List $349.00. **SALE $289.95.**

340K 1571 COMMODORE DISK DRIVE $259.00

Double Sided, Single Disk Drive for C-128 allows you to use C-128 mode plus CPM mode. 17 times faster than 1541, plus runs all 1541 formats.
List $349.00. **Sale $259.00.**

SUPER AUTO DIAL MODEM $29.95

Easy to use. Just plug into your Commodore 64 computer and you're ready to transmit and receive messages. Easier to use than dialing your telephone, just push one key on your computer! Includes exclusive easy to use program for up and down loading to printer and disk drives. *Best in U.S.A.*
List $99.00. SALE $29.95.

VOICE SYNTHESIZER $39.95

For Commodore-64 computers. Just plug it in and you can program words and sentences, adjust volume and pitch, make talking adventure games, sound action games and customized talkies!! FOR ONLY $19.95 you can add TEXT TO SPEECH, just type a word and hear your computer talk — ADD SOUND TO "ZORK", SCOTT ADAMS AND OTHER ADVENTURE GAMES!!
(Disk or tape.) List $89.00. **SALE $39.95**

12" AMBER MONITOR $59.95

Your choice of green or amber screen monitor, top quality, 80 columns x 24 lines, easy to read, anti-glare! PLUS $9.95 for connecting cable. Com-64 or VIC-20. List $159.00. **SALE $59.95.**

PRINTER/TYPEWRITER COMBINATION $249.95

"JUKI" Superb letter quality, daisy wheel printer/typewriter combination. Two machines in one — just a flick of the switch. 12" extra large carriage, typewriter keyboard, automatic margin control and relocate key, drop in cassette ribbon! (90 day warranty) centronics parallel or RS232 serial port built in (Specify). List $349.00. **SALE $249.95.** **(Ltd. Qty.)**

13" RGB & COMPOSITE COLOR MONITOR $259.95

Must be used to get 80 columns in color with 80 column computers (C128 - IBM - Apple).
(Add $14.50 shipping)
List $399.00. **SALE $259.95.**

- LOWEST PRICES • 15 DAY FREE TRIAL
- BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL

PHONE ORDERS
8 a.m. - 8 p.m. Weekdays
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- 90 DAY FREE REPLACEMENT WARRANTY
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Add $10.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES EXCEPT CANADA. Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail!
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GIANT PRINTER SALE!!

List $399.00 **10" Printer**

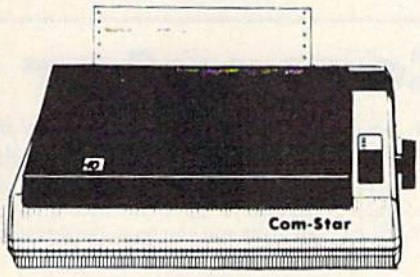
SALE **$169.00** SALE

10" Comstar 10X — This Bi-directional Tractor/Friction Printer prints standard sheet 8½"x11" paper and continuous forms or labels. High resolution bit image graphics, underlining, horizontal tab setting, true lower descenders, with super scripts and subscripts, prints standard pica, compressed, expanded, block graphics, etc. Fantastic value. (Centronics parallel interface.)
List $399.00. **Sale $169.00.**

1 Year Warranty

120-140 CPS

Premium Quality



List $599.00 **15½" Printer**

SALE **$239.00** SALE

15½" Comstar 15X — Has all the features of the 10" Comstar 10X plus a wider 15½" carriage and more powerful electronics to handle large ledger business forms! (Better than FX-100). The 15½" Comstar 15X also prints on standard size paper and continuous forms and labels. Fantastic value. (Centronics parallel interface.)
List $599.00. **Sale $239.00.**

List $499.00 **10" Printer**

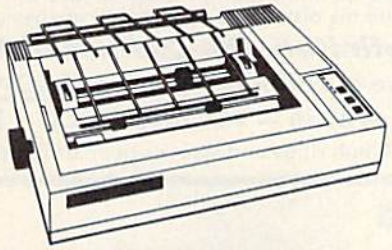
SALE **$199.00** SALE

10" Comstar 160+ High Speed — This Bi-directional Tractor/Friction Printer combines the above features of the 10" Comstar 10X with speed (150-170 cps) and durability. Plus you get a 2K buffer, 96 user definable characters, super density bit image graphics, and square print pins for clearer, more legible print (near letter quality). This is the best value for a rugged dependable printer. (Centronics parallel interface.)
List $499.00. **Sale $199.00.**

1 Year Warranty

150-170 CPS

High Speed



List $699.00 **15½" Printer**

SALE **$289.00** SALE

15½" Comstar 160+ High Speed — This Bi-directional Tractor/Friction Printer has all the features of the 10" Comstar 160+ High Speed plus a wider 15½" carriage and the heavy duty electronics required for today's business loads. You can use large ledger business forms as well as standard sheets and continuous forms and labels. This is the best wide carriage printer in the U.S.A. (Centronics parallel interface.)
List $699.00. **Sale $289.00.**

List $599.00 **10" Printer**

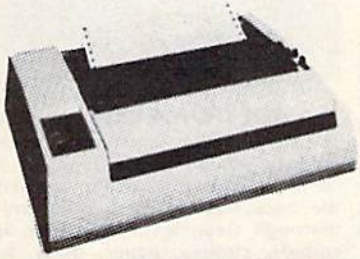
SALE **$259.00** SALE

10" Comstar 2000 — The ultimate printer has arrived! This Bi-directional Tractor/Friction Printer gives you all the features of the Comstar 160 plus higher speed (165-185 cps), 256 downloadable characters, proportional setting, external dark printing mode and a *lifetime printhead warranty. **PLUS ...**

Lifetime warranty*

165-185 CPS

High Speed & Letter Quality



List $599.00 **10" Printer**

SALE **$259.00** SALE

With the flip of a switch you can go into the letter quality mode which makes all your printing look like it came off a typewriter. Turn in term papers, do articles or just print programs. Have the best of letter quality and speed in one package. Fantastic printer (Centronics parallel interface.)
List $599.00. **Sale $259.00.**

• 15 Day Free Trial — 1 Year Immediate Replacement Warranty

Parallel Interfaces

Commodore-64, VIC 20 — $39.00 | Atari — $59.00 | Apple II, II+, IIe — $59.00

Add $10.00 ($14.50 for 15½" Printers) for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA.

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FLOPPY DISKS SALE *59¢ ea.

Economy Model or C-128 Cadillac Quality

We have the lowest prices!

***ECONOMY DISKS** — For use with Commodore 64, Atari, Apple.

Good quality 5¼" single sided double density with hub rings.

Bulk Pac	100 Qty.	59¢ ea.	Total Price	$59.00
Box w/ sleeves	10 Qty.	79¢ ea.	Total Price	7.90

☆ C-128 Computer Disks ☆

CADILLAC QUALITY (Double Sided, Double Density) ***Specifically designed for use with C-128***

• Each disk certified • Free replacement lifetime warranty • Automatic dust remover • Works with IBM PC

For those who want cadillac quality we have the C-128 Floppy Disk. Used by professionals because they can rely on C-128 Disks to store important data and programs without fear of loss! Each C-128 disk is 100% certified (an exclusive process) plus each disk carries an exclusive FREE REPLACEMENT LIFETIME WARRANTY. With C-128 disks you can have the peace of mind without the frustration of program loss after hours spent in program development.

100% CERTIFICATION TEST

Some floppy disk manufactures only sample test on a batch basis the disks they sell, and then claim they are certified. Each C-128 disk is individually checked so you will never experience data or program loss during your lifetime!

FREE REPLACEMENT LIFETIME WARRANTY

We are so sure of C-128 Disks that we give you a free replacement warranty against failure to perform due to faulty materials or workmanship for as long as you own your C-128 disk.

AUTOMATIC DUST REMOVER

Just like a record needle, disk drive heads must travel hundreds of miles over disk surfaces. Unlike other floppy disks the C-128 smooth surface finish saves disk drive head wear during the life of the disk. (A rough surface will grind your disk drive head like sandpaper). The lint free automatic CLEANING LINER makes sure the disk-killers (dust & dirt) are being constantly cleaned while the disk is being operated.

C-128 Disks are definitely the Cadillac disk in the world

Just to prove it even further, we are offering these super LOW INTRODUCTORY PRICES

1 Box of 10 — $9.90 (99¢ ea.) 5 Boxes of 10 — $44.50 (89¢ ea.) 10 Boxes of 10 — $79.00 (79¢ ea.)

All disks come with hub rings and sleeves in an attractive package.

DISK DRIVE CLEANER $19.95

Everyone Needs A Disk Drive Doctor

FACTS

- 60% of all drive downtime is directly related to poorly maintained drives.
- Drives should be cleaned each week regardless of use.
- Drives are sensitive to smoke, dust & all micro particles.
- Systematic operator performed maintenance is the best way of ensuring error free use of your computer system.

NEW RSI-SMARTCARE HEAD CLEANING KIT WITH FREE LIBRARY CASE!

Improper maintenance can cause costly read/write errors on your disk drive. Regular cleaning of heads is essential for maintaining high quality operation and eliminating expensive downtime and repairs. The RSI-Smartcare Dry Process Head Cleaning Kit provides proper maintenance without the mess. Simply insert the cleaning disk into the drive and activate for 30 seconds. This kit contains 1-open ended disk jacket and 2 cleaning pads, good for a total of 30 cleanings. Applicable for both single and double sided drives.

List $29.95. **Sale $19.95.** *Coupon $12.95.*

RSI-COMPLETE PERSONAL COMPUTER CARE KIT!

The RSI Complete Personal Computer Care Kit contains everything you need to properly maintain your computer system. This easy to use kit makes necessary computer care quick and inexpensive. In one convenient package you will get all the necessary products: 5¼" Dry Process Head Cleaning Disk (Good for 15 thorough cleanings); Anti-Static Spray (Eliminates static build-up. For use on carpets, clothes, paper, glass, hard surfaces, and other material); Screen-Terminal Cleaner (Removes smoke, dust, and other contaminants on computer screens and keyboards); Lint-Free Cloths (Non-scratch, non-abrasive, used for cleaning and applying sprays to computers); Foam-Covered Swabs (use to clean those hard to reach places such as keyboards, etc.). GREAT VALUE FOR THE MONEY!! List $44.95. **Sale $29.95.** *Coupon $24.95.*

Add $3.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $6.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA.

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13" Zenith Complete Color Monitor Sale

• Composite • RGB • Sound

Home Computers VCRs Modular TV Tuners Video Games

Excellent Color Reproduction & Special "Green Screen Only" Option

True color reproduction is achieved by a Zenith designed state-of-the-art integrated circuit chip that processes the composite video signal. A custom Zenith analog RGB direct drive gain control integrated circuit allows user-preference for the adjustment of picture drive and black level. Zenith's unique "Green Screen Only" feature eliminates all other colors so that monochromatic text material may be easily displayed in green on the black face screen.

Constant Intensity Character Definition Quality

Quality circuitry design generates crisp lines, pure colors, and sharp character definition for easy-to-read displays. DC-coupling permits the video display to retain its color balance from a single dot to a full screen of data. Even when room lighting changes, a "special light sensor" automatically adjusts the display brightness.

List $499.00

Sale $139.95

Sale $139.95 *LIMITED QUANTITIES*

ZVM 131-Accessible by Many Popular Systems

The ZVM 131 is designed to interface with most personal computers, VCRs, video discs, video games and modular TV tuners that have either composite video or RGB direct drive outputs.

Compatibility Chart

Computer	Interfaces Via
Apple II	Composite
Aplus 3000	RGB
Apple III	RGB
IBM PC	RGB
Commodore 128	RGB/Composite
Commodore 64	Composite
Commodore Vic-20	Composite
TI 99/4	Composite
Atari 800	Composite
Atari 1200	Composite
Atari 1400	Composite

The ZVM 131 Sound Of Quality

The output sound level is externally regulated by a user-adjustment volume control. Use the Zenith quality sound system to monitor the modern audio capabilities of the computer generation.

Easy-To-Reach Front Access Controls

ZVM 131's 13" diagonal display screen can exhibit impressive graphics and intensely clear copy. Easy-to-reach front access user controls (picture, black level, color level, tint, sharpness, audio volume, background noise control) make display adjustment simple and fast. An LED power on indicator notifies the user when the monitor is operable.

Multiple Monitors On A Single Computer

The composite video "loop-thru" feature permits a single composite video source to drive several monitors at the same time. This allows easy display possibilities for multiple viewers in business and educational applications. No more crowding around a single terminal. Everyone enjoys a clear, unobstructed view of important data.

Connection Cables

RGB Cable — $19.95
C128, Aplus 3000 (Specify)

Composite — $9.95
Commodore, Aplus 3000, Atari (Specify)

This Is The Best Value Of The Century

Add $17.50 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $35.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES EXCEPT CANADA.

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COMMODORE 64 COMPUTER $139.95

COMMODORE 128 COMPUTER $289.00

PLUS FREE $69.95 Word Processor

COMMODORE 64 SYSTEM SALE

SAVE!

LIMITED QUANTITIES

Deal 1	Deal 2
Commodore 64	Commodore 64
Com. 1541 Disk Drive	1541 Disk Drive
Com. 803 Printer	13" Zenith Color Monitor
$407	$457
PLUS FREE $49.95 Oil Barrons Adventure	PLUS FREE $49.95 Oil Barrons Adventure

Commodore C128 Computer $289.00 *

C128 1571 Disk Drive $259.00 *

SUPER OFFER **C128 COMPUTER** ***SUPER OFFER***

FREE WORD PROCESSOR COUPON

(Expires 4-1-86) CM46

To Introduce you to the C128 computer we are offering you the finest word processor made, Word Writer II with Spell Checker by Timeworks. When you apply the $69.95 value word processor to your purchase price of the C128 at $289.00 **your net cost is only $219.05.** (1 Coupon per family)

C128 Word Writer with 85,000 word Spell Checker — An 80 column professional word processing system that includes a spelling checker and a built in calculator. Easy to use because of the full screen format, you can view the document on your screen as it will appear when printed. Pull-down menus mean that the user doesn't have to memorize commands. You press a key to activate a Word Writer feature and the program guides you through its proper use with logical and easy-to-follow prompts. The program has been designed to interface with Timework's Data Manager 2, a database program and Swiftcalc, a spreadsheet. Contains all the features you'll need for everyday word processing, plus more sophisticated features such as document chaining, form letter printout, page separations, horizontal and vertical scrolling and much more. (Disk) List $69.95.

* **Commodore C128 Computer $289.00.** This all-new revolutionary 128K computer uses Commodore 64 computer software, CPM Software, plus new advanced C-128 software. You pay only $289 for the C128 computer! **Less** the value of the **Special Software Discount Coupon** (see page 14 of our 64 page catalog) we pack with your computer that allows you to **Save Over $250** off software sale prices!! With only $100 of savings applied your net computer cost is $189.00. ***PLUS FREE $69.95 Word Processor.*** **

* **340K 1571 Commodore Disk Drive $259.00.** Double Sided, Single Disk Drive for C-128 allows you to use C-128 mode plus CPM mode. 17 times faster than the 1541, plus runs Commodore 64 software. You pay only $259.00 for the 340K 1571 Commodore Disk Drive. **Less** the value of the **Special Software Discount Coupon** (see page 14 of our 64 page catalog) we pack with your Disk Drive that allows you to **Save Over $250** off software sale prices! With only $100 of savings applied your net Disk Drive cost is only $159.00.

Add $10.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES, EXCEPT CANADA.

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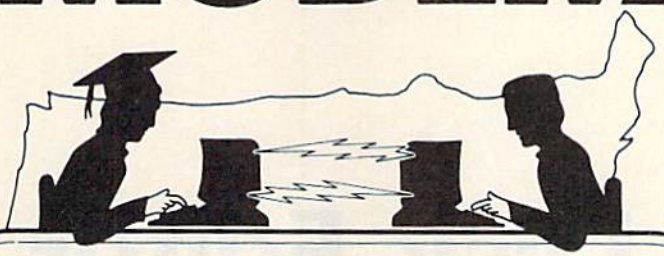
Commodore 64

MODEM

Commodore 64

Sale

SAVE



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Disk Editor

Kevin Mykytyn, Editorial Programmer

For more advanced readers, here's a utility that offers power and flexibility unavailable with BASIC. With a few commands, you can easily examine and alter any byte on a disk. For the Commodore 64, Plus/4, 16, and 128 (in 64 mode).

You probably use your disk drive mainly for saving and loading BASIC programs, occasionally dabbling in sequential and relative files. BASIC provides simple commands for using each type of file: SAVE, LOAD, PRINT#, etc. When you type SAVE, for example, you don't have to worry about what instructions to give the disk drive to make it write your program on the disk. BASIC works together with the Disk Operating System (DOS) to automatically perform all the necessary tasks.

The disadvantage of using these simple commands instead of accessing the disk directly is lack of control and power. For example, DOS has a scratch command, but not an unscratch command. So if you accidently scratch a file, there's no way to bring it back, even though all the information is still on the disk. And DOS has the ability to lock a file so that it can't be scratched, but no command is available for using this feature.

Accessing the disk directly gives you much more power and flexibility. DOS has several low-level commands for this purpose. The Block Read and Block Write commands enable you to change the contents of an individual block or sector. But these commands are difficult to use.

"Disk Editor" makes it easy to examine and alter any byte on the disk. Since it's written entirely in machine language, "MLX," published frequently in COMPUTE!'s GAZETTE, is required to type it into a 64 (Plus/4 and 16 users should see below for instructions). After loading and running MLX, answer the prompts for starting and ending addresses with 2EE0 and 364F, respectively. Type in Disk Editor and save it to disk. To run it, type LOAD *"filename"*,8,1 and NEW. Then insert the disk you want to edit and type SYS 12000. *Note: Before using one of your regular disks, test Disk Editor with a new disk containing copies of a few programs. If you've made a typing error when entering the program, it could ruin programs on the disk.*

If you're a Plus/4 or 16 owner, you don't need to type in MLX; you can use the built-in machine language monitor. Enter MONITOR to enable Tedmon and then use the memory display command: M 2EE0. Now type in the hexadecimal listing, *omitting the ninth number on each line.* The first eight numbers are the ML program in hex form, the last is a checksum used by MLX. Since you're using the monitor, you don't need the ninth number. As you finish a section of memory, you can type M without a memory location to see the next section. When you're ready to save, use this syntax: S *"filename"*,8,2EE0,3650. To use Disk Editor from BASIC, LOAD *"filename"*,8,1 and then SYS 12000.

How To Use It

To use Disk Editor effectively, it's important to understand how a disk is organized. A Commodore disk is divided into 35 tracks, each containing a number of sectors (see table 1). Each sector contains 256 bytes. A disk has a total of 683 sectors, but only 664 are available for data storage because the directory occupies all 19 sectors of track 18 (track $12 in hexadecimal).

Disk Editor begins by reading track $12, sector 0, and displaying the 256 bytes in that sector. (All numbers in Disk Editor are in hexadecimal for better screen formatting.) The editing cursor appears in the upper-left corner. Move it around the screen with the cursor keys. The sector currently being displayed is indicated at the top of the screen along with the track number and the current byte number within the sector. Notice how the byte number changes as you move the cursor. Press the HOME key to quickly position the cursor at the upper-left corner.

To make a change, move the cursor to the desired byte and type in the new value. This doesn't change the actual byte on the disk. When you've made all the changes

you want on that sector, press CTRL-W to write the sector to the disk.

To display another sector, press + and type the new track number at the top of the screen. Press − to change the sector number. The INST/DEL key allows you to correct mistakes. Then press CTRL-R to read the sector and display it on the screen. If a track or sector number is outside the range shown in Table 1, Disk Editor prints ILLEGAL TRACK OR SECTOR and cancels the CTRL-R command.

Table 1:
Number of sectors per track

Track	Number of sectors
1–17	21
18–24	19
25–30	18
31–35	17

Disk Editor checks for errors on all commands. If an error occurs, a message is printed and the command is aborted. Press any key to continue.

To quickly get to an adjacent sector, hold down SHIFT and press + or −. Pressing + with SHIFT displays the next highest sector, and pressing − with SHIFT displays the previous sector.

Another way to move around the disk is CTRL-J (Jump), which uses the number under the cursor as the track and the number in the next byte as the sector. This is handy for jumping to chained sectors.

A program on disk is stored not in sequential sectors, but in sectors scattered about the disk. To link all these sectors together, the first two bytes of each sector contain the track and sector numbers of the next sector in the chain. The last sector is flagged by a zero in the first byte. The second byte contains the number of bytes used in the sector. To jump to a chained sector, press HOME to put the cursor on the link bytes, then press CTRL-J.

When examining sectors containing a BASIC program or a text file, it's helpful to display the bytes as screen code or ASCII characters. CTRL-A toggles between screen codes and hexadecimal format. When you're in screen code format, pressing the Commodore and SHIFT keys together toggles between ASCII and screen code format. *SpeedScript* and some other word processors store text as screen codes, while *EasyScript* saves documents as ASCII codes.

CTRL-$ displays the normal directory. Hold down SHIFT to pause the scrolling. To exit the program, press CTRL-X. It also closes all files, and initializes the disk.

Changing The BAM

Bytes $4–8F of sector 0 are the Block Allocation Map (BAM). The BAM is divided into 35 groups of four bytes each, one group for each track. The first byte of each group is the number of free sectors on that track. Each bit in the other three bytes represents a sector on the track. If a bit is on, it means the sector is free. If it's off, the sector is used.

Track $12, the directory, contains all the information about how the files are organized on the disk. By changing a few bytes in this track, you can perform some neat tricks. Sector 0 contains the Block Allocation Map (BAM), and the other sectors store the directory entries and are linked by the first two bytes in each sector.

Bytes $2–1F of sector 1 contain information about the first file in the directory. Byte 2 is the file type. A value of $82, for example, indicates a PRG file. By setting bit 6 of the file type, you can lock the file to keep it from being scratched. Simply change the 8 to a C and remember to write the sector to the disk with CTRL-W. If you display the directory with CTRL-$, you should see a < character next to the file type, indicating a locked file.

Bytes 3 and 4 contain the track and sector numbers of the first sector that the file is stored. You can view the contents of the file by positioning the cursor on byte 3 and pressing CTRL-J. Press CTRL-J again to jump to the next sector in the chain, and so on.

Recovering A Scratched File

If you should accidentally scratch a file, you can unscratch it with Disk Editor. Follow these steps:

1. Don't save anything to the disk with the scratched file; you may overwrite the sectors containing the program or data.

2. Load Disk Editor, insert the disk to be altered, and SYS 12000.

3. Display track $12, sector $00. Press CLR/HOME to go to the top and then CTRL-J (to get to the first track of directory entries).

4. Switch from hex to ASCII, to look at the filenames, which should be at locations $05, $25, $45, and so on. If the file to be unscratched is not in the sector, press CLR/HOME to go to the first two bytes and then CTRL-J, to jump to the next sector.

5. When you've located the correct directory entry, look three bytes to the left—$02, $22, $42, etc. A $00 in this location marks a scratched file. Change it to $82 to make it a program file, $81 for a sequential file.

6. Write the sector back to the disk with CTRL-W and exit with CTRL-X. To make sure the BAM is correctly updated, you should validate the disk with the line OPEN 15,8,15,"V0". This process may take some time, but when it's done, the file has been restored.

See program listing on page 113.

Table 2: Disk Editor Commands

CTRL-A	Alternate between hexadecimal and screen code.
CTRL-J	Jump to track and sector under cursor.
CTRL-R	Read track and sector at top of screen.
CTRL-W	Write to track and sector at top of screen.
CTRL-X	Exit program.
CTRL-$	Display directory (SHIFT to pause).
SHIFT-Commodore	Toggle between screen code and ASCII.
SHIFT-+	Display next sector.
SHIFT-−	Display previous sector.
+	Set track number.
−	Set sector number.
INST/DEL	Delete a character when entering track or sector number.
HOME	Position cursor at upper-left corner.
Cursor keys	Move cursor.

hints & tips

Disk Or Tape?

Joseph Celentano

If you've discovered a clever time-saving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s GAZETTE. *If we use it, we'll pay you $35. Due to the volume of items submitted, we regret that we cannot reply individually to submissions.*

You've probably seen programs in COMPUTE!'s GAZETTE which need to access files on disk or tape. The program may be listed in two parts; the first program loads and runs the second. Or the program may store important information in a data file. The article about the program usually has a section that says something like "This program was written for a disk drive; if you own a Datassette, you'll have to make the following modifications," followed by several lines that must be changed to make it work with tape.

Why not make such programs universal by having the program adjust itself for tape or disk? We need a way to figure out what kind of storage device is attached to the computer. We could include a line that prints **(T)APE OR (D)ISK?** and then GETs an answer from the user. That's one solution; here's another:

Location 186 on the VIC, 64, and 128 keeps track of the current device number. The Plus/4 and 16 use location 174 (if you own either of these machines, substitute 174 for 186 in the following paragraphs).

The number contained in 186 tells you which device was most recently accessed. So after a tape load, PRINT PEEK(186) returns a 1. After a disk load, you'll find an 8 if there's a single drive attached. Additional disk drives will have device numbers in the range 9–11. If the printer was just used, there will be a 4 (or possibly a 5 or 6) in location 186. And so on.

Since the program has to be loaded into memory from disk or tape, you can PEEK 186 at the very beginning of the program to find whether the user has a Datassette or a disk drive. This could be the first line in your program:

```
10 DV = PEEK(186)
```

If you plan to load another program later, use **LOAD *"filename"* ,DV**. To read from a data file, add **OPEN 1,DV,DV−1,*"filename"*** at the appropriate position in the program.

The advantage to PEEKing 186 to find the current device is that you can write a single program that can access files on either disk or tape, based on the device from which the program was loaded. And you don't have to bother the user with **(D)ISK OR (T)APE?** prompts.

This technique is especially helpful when you own more than one disk drive. You can write programs that will work without modifications on any one of the drives. Most software, whether commercial or public domain, defaults to device 8, which means you don't often get to use your other drives.

You'll occasionally run into problems, though. If you load a program from device 8 (a disk drive) and then list it to device 4 (the printer), PEEKing 186 will return a 4 since the printer was the last peripheral accessed. If you then run the program, it may attempt to load or input from the printer, which is not possible. You can avoid this situation by choosing a default value for DV and changing it only if PEEKing 186 returns certain values:

```
10 DV=1: EE=PEEK(186): IF EE>7
   THEN DV=EE: REM TAPE DEFAULT
10 DV=8: EE=PEEK(186): IF (EE=1) OR
   (EE>8) THEN DV=EE: REM DISK
   DEFAULT
```

If you ever trade original programs with friends or contribute to a user group library, you'll find this method of checking for the current device number quite handy.

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Blink Mode On Commodore Machines

David Sanner

Here's a way to bring your color screen to life. The article presents a good tutorial with lots of programming explanations and tips. Two demonstration programs are also included. For the Commodore 64, 128 (in 64 mode), Plus/4, 16, and VIC-20.

Have you ever seen the Apple II's "video blink mode" and wished for a similar feature on your Commodore computer? Here's a program that provides that feature for the Commodore 64, Plus/4, 16, and VIC-20. Let's look at what "Blink Mode" can do.

The basic purpose of Blink Mode is to allow text characters to blink (switch) between two different colors at varying speeds. For instance, you can tell Blink Mode to blink the color white to the color black. Thereafter, any characters printed to the text screen in white will alternate between white and black. You aren't, of course, restricted to just white and black; you can get 8 colors blinking to 8 different colors, and in special cases, you can get all 16 colors (on the 64, Plus/4, and 16; 8 colors on the VIC) blinking to different colors.

The USR Interface

In this program, the USR command controls what Blink Mode does for you. If you're not familiar with this powerful, but little used command, let's look at a bit of background. There are two bytes in memory reserved for use with the USR command. These bytes hold the address (in standard low-byte/high-byte format) of the location in memory that the computer will go to when USR is executed. We have to make this address point to the location of Blink Mode with the following POKES:

For the 64:

```
POKE 785,0: REM LOW BYTE OF $C000
POKE 786,192: REM HIGH BYTE $C000
```

For the Plus/4 and 16:

```
POKE 1281,0: REM LOW BYTE OF $3C00
POKE 1282,60: REM HIGH BYTE OF
      $3C00
```

For the VIC-20:

```
POKE 1,0: REM LOW BYTE OF $1C00
POKE 2,28: REM HIGH BYTE OF $1C00
```

As you can see from the POKEs above, Blink Mode is located at $C000 on the 64, at $3C00 on the Plus/4 and 16, and at $1C00 on the VIC-20. The first POKE sets up the low byte of this address, which is $00. The second POKE sets up the high byte of the address ($C0 is 192 in decimal, $3C is 60, and $1C is 28). Once these values are in place, everytime you use the USR command, the computer will jump to Blink Mode.

Controlling an interrupt-driven routine like Blink Mode can often be tricky business. I tried to minimize the amount of interaction you need to get it to do interesting things—which is why I chose to use the USR command. It not only calls up a machine language routine (like the SYS command), but it also lets you send a value to the routine quite easily (SYS doesn't on the VIC or 64). Additionally, the USR command returns a value to the program. This means that Blink Mode can tell you whether or not your command was OK by simply passing back different numbers. If everything went according to plan, Blink Mode will pass back a value of 1. If something went awry, it will return a 0. This is helpful should you ever want to test whether or not the command worked in your program.

Because the USR function returns a value, you must assign the value to a variable. This means you must use the USR command in the following manner:

```
X = USR(data)
```

In the above example, *data* is the important part, the number sent to Blink Mode. The data to be passed to the routine via a USR command must be enclosed between the parentheses, as in X=USR(16384). Once Blink Mode has set things up, it returns a value to your BASIC program; the variable X will hold the value that the USR command passes back.

How To Use Blink Mode

There are seven commands that you can pass to Blink Mode via the USR command. In order to pass a command to Blink Mode, you must send a specific number via the USR command. The number depends on what command you send. For instance, to send the Enable Blink Mode command, you must call Blink Mode like this: X=USR(4096). Whenever I use Blink Mode in a BASIC program, I set variables to equal the command numbers, as with EB=4096. Then I can use them in the USR command: X=USR(EB). Some of the commands require you to send data as well as the command number. Here are the commands for Blink Mode:

Enable Blink Mode (4096)—Every 1/60 of a second, the computer interrupts itself, saves what it was doing, and jumps to a special location in memory. Normally, this location is the start of some operating system routines which perform necessary tasks like checking the keyboard and advancing the jiffy clock. When Blink Mode is enabled, however, this location points to the part of Blink Mode that takes care of blinking the colors. After Blink Mode is finished running, it jumps to the normal interrupt location. This kind of program is often known as an "interrupt wedge." The Enable command must be sent if you want to see the colors blink. You can send it with X=USR(4096).

Disable Blink Mode (8192)—This command will instantly stop Blink Mode from being an interrupt wedge. You can send this command by X=USR(8192).

Blink Color (1024)—When you want to make a specific color blink to another color, you must use this command. Just add to the command number (1024) the number of the color you want to blink. Then add 16 times the number of the color you wish to blink to. For example, if you want the color white (color 1) to blink to black (color 0), you would send the following command:

```
X=USR(1024+(16*0)+1)
```

(Note that color numbers range from 0–15 on the 64, Plus/4, and 16; from 0–7 on the VIC.) The original color and the color you want it to blink to should always be different.

Stop Color From Blinking (2048)—If you want to stop a specific color from blinking, then send this command. Just add the number of the color you want to stop blinking to the command number (2048). For instance, if you wanted to stop cyan from blinking to some other color, you would send X=USR (2048+3). Three is the color number for cyan. It's important to note that you should only turn off a color that was set to blink, not the color it was blinking to. In other words, if you tell cyan to blink to red, you should tell cyan to stop blinking. This command will wait until all characters typed in the requested color have returned to that color before stopping it from blinking. For example, if green is told to blink to black, and a "stop green from blinking" command is sent, Blink Mode will wait until black characters have turned back to green before stopping green from blinking.

Set Delay (16384)—This command allows you to set the time it takes to blink between two colors. This time ranges from 1/60 of a second to about 4.5 minutes. (Note that all blinking colors will blink at the same rate.) You send this command by passing the command number (16384) plus the time value. The time values range from 1, which sets the time delay to about 1/60 of a second, to 16383, which sets the delay to about 16383/60 seconds (4.5 minutes). Every time you add one to the time value, you add 1/60 of a second to the delay. The number 60 will make the blink time about one second. You send this command like this: X=USR (16384+2). In this example, this call would set the time between color changes to 2/60 of a second. Note that the lower this number, the faster the blink, but the slower everything else (like your BASIC program). This is because Blink Mode must update the entire color screen whenever the time value you set runs out. If the time value is very small, you'll notice things slowing down because Blink Mode is running more frequently.

Return Value (512)—Normally, when you're using Blink Mode, the command X=USR (command) will make X either 1 or 0, depending on whether or not Blink Mode understood the command. However, we can also pass back other values. Let's say at some point in your program you wanted to know which color blue was blinking to. With the Return Value command, you can do this. Simply send the command number (512), plus the number of the color to check. For instance, the command X=USR(512+6) will assign to X the color number that blue was told to blink to. Note that if a color is not blinking to another color, it will then return itself. For example, if green is not blinking to another color, X=USR(512+5) should return 5, the number for green.

Reset All Colors (256)—There will be certain times when you're experimenting with different colors and things just get out of hand. If this happens, this command will reset all the colors to blink to themselves, thus making it appear that none of them are blinking. To use this command, send the command number (256) to Blink Mode. As with the Stop Blinking command, this command will wait until the colors have returned to their original values before resetting them.

Using Blink Mode In Your Own Programs

There are a few important items to keep in mind when you write programs to use with Blink Mode. First, each color can blink only to one other color. Second, each color must blink to a color that no other color is blinking to. For instance, if you have green blinking to red, you should not try to have white blinking to red also. If you do this, you'll get strange (but often interesting) results.

You should always reset a color from blinking before making it blink to another color. Because Blink Mode waits until the color has returned to its original value, however, this command may take a while (depending on the time delay between blinks). One way to get around this is to use the following code:

```
10 X = USR (2048+6): REM STOP BLUE
   FROM BLINKNG
20 X = USR (16384+1): REM SET
   DELAY TO MIN.
30 X = USR (512+6): IF X<>6 THEN 30:
   REM WAIT
40 X = USR (16384+600): REM RESET
   ORIGINAL BLINK DELAY
```

Let's assume you've set the time delay to a very high value (say ten seconds). When you send the "stop blue from blinking" command, it could take up to ten seconds for blue to stop blinking. (For example, if Blink Mode had just changed all the blue to red and you send this command, it will be ten seconds before Blink Mode can change all the red back to blue. Once it does that, it will stop blue from blinking to red). So, in order to speed things up a bit, I set the time delay to a minimum; this stops blue from blinking almost immediately. Line 30 checks the value of the color that blue is blinking to. If blue has been reset, then it will be blinking to blue. If it hasn't been reset yet, then we simply keep running line 30 until it has. Line 40 resets the time delay to its original value. (These BASIC lines can also be used with the Reset All Colors command.)

If you don't care whether the color gets reset (to its original color) before it stops blinking, then you can use the following code.

```
10 X = USR (1024+(16*6)+6): REM
   BLINK BLUE TO BLUE
20 X = USR (1024+(16*3)+3): REM
   BLINK CYAN TO CYAN
```

In this example, we assume that blue has been told to blink to cyan. What this code does is manually reset the colors by telling them to blink to themselves. The benefit of this sequence of commands is that it happens immediately: no waiting for the time delay. Unfortunately, there's no guarantee that the cyan will have blinked back to blue when you send this command.

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A Little More Advanced

I saved this section for last, because it deals with more complex ideas, and involves a little more programming. Normally, (on the 64, Plus/4, and 16) you can get eight colors on the screen blinking to eight other colors with no problem. If you try to blink all 16, or try to blink a color to a color that has been told to blink (for instance, if red was told to blink to white, and you told yellow to blink to red) it may not always work right.

Since there's no way for Blink Mode to know whether the characters on the screen are blinking to a color, or started out as that color, Blink Mode will treat them as the same color. Using our example from the start of this section, you may try to type something in red. As Blink Mode runs in the background, it has no way of knowing that the red you have typed on the screen is not the red that it just changed the yellow to. So, it will just change all red back to yellow, and you'll never see white.

There is, however, a way to get around this. It involves more planning, and cannot be used "on the fly," as you'll see. Here's what you must do: Blink Mode must be disabled to prevent it from trying to change any colors. Then you must set up any colors you want to blink. Any text you have should then be written to the screen, in the original color. Then, simply enable Blink Mode. The colors will begin to blink back and forth.

I call this technique "doubleblink" because two text lines will trade colors back and forth. This can provide quite interesting effects. As an example, let's say we wanted to have two lines of text blink back and forth between white and black. We follow the above guidelines, and we write one text line in black, and the other in white. We set everything else up, and then enable Blink Mode. One second (or whatever time delay you prescribe) the first line is black and the second is white, the next second the colors switch, and so on. This is a nice effect, but it must be controlled. For example, if we try to type something in white now, some of the text we type will be out of sync with the rest that we type.

If all this seems very complex, don't worry. As with most other things, experimentation is the best way to discover. I've included two programs that demonstrate some of the things you can do with Blink Mode. Program 4 is a basic demonstration of Blink Mode. Program 5 demonstrates the technique of doubleblink. (*Note that a few changes are required for use with the Plus/4, 16, and VIC. These are noted in REMs in the listings.)* Each of these demos automatically loads and runs the machine language portion of the main Blink Mode program (Programs 1, 2, and 3) provided that the main program was saved as BLINKOBJ on the same disk. If you've saved the main program with another filename, be sure to change it in line 99 of Program 4 and 5. If you're using tape, change the load instruction in this same line to LOAD "BLINKOBJ" ,1,1.

Incidentally, I've used Blink Mode with a 300-baud modem and terminal program with no problem. The time delay was set to about 10.

See program listings on page 116.

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Custom Labels

R. E. Metzler, Jr.

This program makes it easy to design and print labels. It also lets you save designs on disk for future use. For the Commodore 64, 128 (in 64 mode), Plus/4, and 16, with Commodore 1525, 1526, MPS-801, 802, 803, or compatible printers. A disk drive is required.

Printing your own customized labels is easy with this menu-driven program. All you have to do is answer the menu prompts and develop your design. "Custom Labels" does the rest. It's written in BASIC for the Commodore 64 and 128 (in 64 mode) with a Commodore 1525, MPS-801, and MPS-803 printer. Type in the program and save a copy to disk. If you have a Plus/4 or 16, or a Commodore 1526 or MPS-802 printer, you'll have to make a few changes to the program.

If you have a Plus/4 or 16, substitute these lines:

```
AX 10 COLOR0,2:COLOR4,3,3:POKE
      2025,255
GG 200 IF P=1 THEN X=3074:FOR
      {SPACE}I=0 TO 7:FOR J=3
       TO 38
MS 210 IF P=2 THEN X=3083:FOR
      {SPACE}I=0 TO 7:PI$=CHR
      $(14):FOR J=12 TO 29
```

If you have a Commodore 1526 or MPS-802 printer, substitute these lines:

```
CF 310 PI$=PI$+SI$:X=X+1:NEXT:
      PI$=PI$+CHR$(13)
EF 320 PRINT#4,PI$:PI$="":IFP=
      1THEN X=X+4
```

Menu Choices

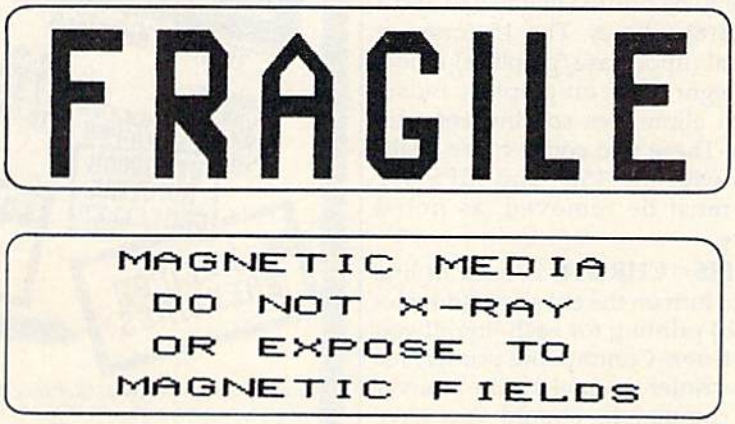
After typing in the program, save it to disk. To use Custom Labels, load it and type RUN. (Be sure your printer is turned on.) A two-option menu appears: 1. Graphics Labels or 2. Enhanced Printing Labels. Graphics Labels is for standard-sized characters, and Enhanced Printing prints double-width characters. With either selection, you can use any keyboard characters, including Commodore graphics characters. After making your selection, you're presented with the main menu and a workspace for designing your label. The design area is automatically sized for the printing format, and it's centered for standard-sized labels, 3-13/16 inches long.

The main menu offers five choices: 1. Design a Label, 2. Load a Label from Disk, 3. Change the Label, 4. Save the Label to Disk, and 5. Print the Label. Initially, you'll choose the first option. After pressing 1, you'll see the workspace with a cursor at the upper-left corner. Now you can begin designing your label. *Use only cursor keys to move around the work space. Do not use the INSerT/DELete key.* Also, do not press RETURN after each line. Just use the cursor keys to get to another line (more on RETURN below).

Also, note the reminders at the bottom of the screen. The workspace size is proportional to the size of the label you'll be printing on, so you'll need to center what you want printed. If you're designing, say, an address label, be sure to leave a blank line between printed lines to make your label more readable.

Any characters may be used in your design, although there is a minor restriction on using commas and colons. Normally, when you've finished designing your label, you press RETURN, as noted at the bottom of the screen. However, if you've used commas or colons, you must press RETURN over a line without either of these punctuation marks. Say you're trying to create the following label:

John Doe
123 Main Street, Apt. A-5
Oakwood, CA 90067



These labels were produced with a Commodore 64 and MPS-802. The "Fragile" label was created with keyboard graphics characters. The "Magnetic Media" label illustrates the enhanced printing mode (double-wide characters).

You would type John Doe, cursor down and type the street address, cursor down and type the city, state, and zip code, then cursor up to the first line (the only one without a comma) and press RETURN. If you're designing labels and wish to use commas or colons, be sure that there's one line that does not include them.

After completing a label design and pressing RETURN, the menu reappears. At this point, you can print out, save (to disk), or edit the label. When saving a design, enter a filename at the prompt. After pressing RETURN, the label is saved to disk. It can be reloaded at any time by selecting the load option from the menu. Just enter the filename at the prompt. Should you forget the filename, list the directory of the disk to which you saved the label (it will appear on the directory as the exact name you used to save it).

Printer Modifications

Some Commodore-emulating printers may require slight program changes to set the line spacing or restore the printer to normal operation. **OPEN6,4,6: PRINT#6, CHR$(12)** is used in line 190 adjust the space between lines on the 1526/802. In line 350, **CLOSE6: OPEN10,4,10: PRINT#10: CLOSE 10** is used to reset the 1526/802 printer to normal operation (neither of these commands has any effect on the 1525/801/803, so they were left in). To adjust spacing on the odd-numbered printers (1525/801/803), a CHR$(15) precedes the string to be printed in line 320 and a CHR$(8) follows. The 15 turns on normal (uppercase/graphics) mode. The eight turns on graphics mode, which eliminates spacing between lines. These two codes cause problems with the 1526 and MPS-802 and must be removed, as noted above.

PI$=CHR$(14) is used in line 210 to turn on the enhanced (double-width) printing for each line. If you own a non-Commodore printer, see your printer manual for the equivalent commands, should you have any trouble.

See program listing on page 112.

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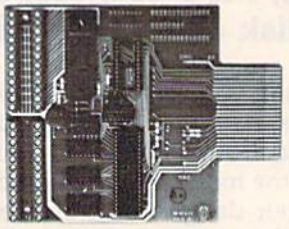

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Cardinal Software

Mini-Filer

Kevin Martin

This flexible file manager for the Commodore 64 and 128 (in 64 mode) is fast and easy to use. Single key commands allow you to create, add, edit, search, load, save, and print out. A disk drive is required.

Databases are powerful tools for many applications. They can manage any information you need to store and retrieve. "Mini-Filer," while not a full-featured database, allows you to easily create and manage any number of files by providing various single-key commands for creating, adding, editing, searching, and printing out.

Because Mini-Filer is a general-purpose file manager, it can be used for many applications. It's not designed to fulfill a specific purpose, so it's general enough to handle many different types of files. For example, you could create a name and address file (name, street, city, state, zip code, and phone number), a file for your garden (plant name, gestation, watering/feeding needs, and harvest time), and a file for your library (title, author, publication date, publisher, and subject).

Each grouping of information within a file is a *record*. For example, "John Doe, 123 Main Street, Anywhere, USA 11111, 888-999-9999)" could be one record within an address file. When you enter a new name, address, and so on, you're adding another record. In Mini-Filer, there's no restriction to the number of records (outside of the normal limitations of computer memory and disk space), but exercise common sense when creating a file. Remember, the longer your file, the longer the search time to find a record. And if the record size is fairly small, you'll be able to fit more records into available memory.

Finally, each record contains one or more *fields*. In the examples above, name, street, and city are fields within the address file, and author and publisher are fields in the library file. The fields can be *alphanumeric*, meaning any characters are allowed, or *numeric*, containing numbers only.

Think of the structure as a recipe card box. The entire collection of cards is the file. Each card is a record inside the file. And each line on the card is a field.

If you see how all this information is organized, you can see how useful a file manager like Mini-Filer can be. There are a multitude of applications. Aside from those noted above, you can create a file for home inventory, collections (cards, coins, stamps, record albums, and so on), gifts, recipes, Christmas cards, and mailing labels, to name a few.

A Few Steps

Using Mini-Filer requires three basic steps: create a file structure, enter records, and save these records to disk for later use. Mini-Filer also allows you to print out a single record or an entire file at the stroke of a single key. A printer is not required for use with the program, however.

Mini-Filer is written entirely in machine language and must be entered with "MLX," the machine language entry program, found elsewhere in this issue. After loading MLX, respond to the prompts for starting and ending addresses with 0801 and 10B8 respectively. After typing in the program, save a copy on disk. To load and run Mini-Filer, type LOAD"*filename*",8 and RUN.

Creating A File

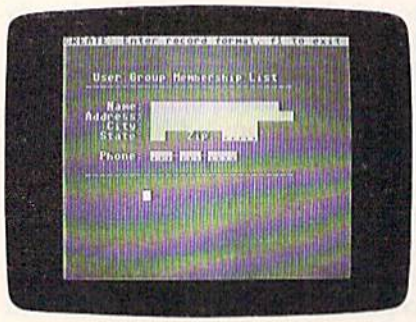
After running Mini-Filer, you'll see a gray screen with a command line at the top which includes a series of letters, each of which represents a command: A (add or enter), C (create), F (find), P (print a record), R (print a file), f7 (load a file from disk), f8 (save a file to disk), CLR (clear data from memory), up (cursor up), and down (cursor down). For a complete list with more detailed explanations, see the Mini-Filer Commands chart elsewhere in this article.

To get started, press C to create a file. You'll notice that the command line has changed to read "CREATE: Enter record format, f1 to exit." (If you have a file already in memory, this option is not allowed.) You'll notice the cursor at the top left corner of the screen, beneath the command line. Think of the screen as a blank file card on which you can write anywhere. Using the cursor keys, move the cursor to where you wish to begin. Any location on the screen is acceptable, but note that each record is restricted to one screen of information.

First type a label that describes the information in the field that will follow. Determine the maximum number of characters you'll need (up to 128 characters per field). For example, in creating a name and address file, you might type "Name:" and decide that 18 characters would be enough for even the longest name you'd enter. Next, press SHIFT and the space bar to allocate the number of spaces for the field length. In our example, you would hold down the SHIFT key and press the space bar 18 times. Your result will look like this:

If you've made any typing errors, use the INSerT/DELete key to edit. Press RETURN when you've finished defining the length of a field. (In our example, press RETURN after the eighteenth space has been entered.) The cursor will then jump to the beginning of the line below. Next, move the cursor to where you want to type the name of the next field label. Repeat the procedure just described until you've completed a record.

If you plan to use a numeric field (like a phone number or zip code), press the Commodore key and the space bar rather than a shifted space. (A numeric field appears as reverse periods; an alphanumeric field—letters and/or numbers—appears as reverse spaces.) A typical name and address file record might look like this:



The command line at the top of the screen reminds you to press f1 to exit the format creation mode. Now you're ready to enter data. The original command line will reappear. Press A (for adding or editing a record). This puts you in Add mode. You'll see "ADD Record" appear in the command line, and the cursor will immediately go to the first space in the first field you've defined.

Now begin entering information. After typing in the data for one field, press RETURN. The cursor will automatically jump to the first space in the next field. If you reach the last available space in the field and type a character, the cursor will jump to the first space in the next field. The INSerT/DELete key may be used in case of typing errors. If you've defined a field as numeric only (appearing as reverse periods), it will accept only numeric characters.

Continue entering information until all fields in the record have been entered. Pressing RETURN when you're at the last character of the last field will return the cursor to the first character of the first field. At this point, you should proofread the record just entered. If you've discovered a typing error, press RETURN until you're at the beginning of the field that contains an error and move to the unwanted character with the cursor-right key. After making the correction, press RETURN.

To proceed to the next record, press f7. You'll see the formatted fields with the cursor in the first position of the first field. After completing the record, you can proceed to enter another by pressing f7, or you may exit the Add mode by pressing f1. The latter choice will return the original command line. At this point, you can move through all records by pressing the cursor-up key to read the previous record, or the cursor-down key to move to the next record. When the screen shows the format field—the fields with no entries—you're at the last position in the file. At this point, if you wish to enter a new record, press A and type in new data. If you wish to edit a record, press A while the record you wish to edit is on the screen.

Searching For Data

To search for any information, press F (for Find). You're then prompted to enter the characters you wish to search for. After entering them, press RETURN. Mini-Filer will instantly find the requested information and display the record which contains it. The original command line is then returned. To search for any subsequent occurrences, press SHIFT-F. The search will continue from the next record, and so on.

If the information requested is not in the file, the command line will display "Not Found." (When searching, be sure to enter the word you're looking for with the exact spelling, including capital and lowercase letters—"Spanish" will not be found if you enter "spanish.") Also, Mini-Filer will find a string of data within a field. For example, if you're searching for an area code—which is a portion of the phone number field—you would type the three-digit code and Mini-Filer will find it.

Saving And Loading

From the main command line, you can load or save a file at any time. To save a file, press f8. You'll be prompted for a filename. After typing one in, press RETURN and the file will be saved to disk as a program file with the name you specified.

To load a file from disk, press f7. You'll be prompted for a filename. After entering one, press RETURN and Mini-Filer will load the file from disk. After the file has loaded, the first record in the file will be displayed. Press any key to get the main command line.

Should you mistakenly press f7 or f8 and get a LOAD or SAVE prompt, press RETURN to get back to the main command line.

Printing Options

To print the current record, the one displayed, press P. This prints *only* the current record. To print the entire file, press R (for Report). The printed characters will appear just as they do on the screen.

Erasing A File

At some point, you may wish to erase the data in a file from memory and start over. To do this, press CLR (SHIFT–CLR/HOME). You're asked "Are You Sure?" Press Y if you wish to erase it or N if you'd rather reconsider. CLR is also useful if you plan to work with more than one file in a single sitting. You create the first, save to disk, and then press CLR. You can now load (or create) the second file.

Mini-Filer Commands

A—add or edit data
C—create a database file
F—find a field (any string of characters)
SHIFT-F—continue searching for next occurrence (may be used only after F)
P—print the record displayed
R—print the file
f7—add a record (in Add mode); load a file from disk (from main command line) f8—save a file to disk
CLR—clear all file data from memory
up (cursor key)—move the cursor up (from Create mode) or move to the previous record (from main command line)
down (cursor key)—move the cursor down (from Create mode) or move to the next record (from main command line)

See program listing on page 120.

Disk Commands On The 128

Todd Heimarck, Assistant Editor

Whether you have a 1541 disk drive or a new 1571, this article will show you how to use the powerful disk commands of the 128. A number of useful hints and shortcuts are included.

The Commodore 128's BASIC 7.0 is a vast improvement over previous Commodore BASICs. The computer has its share of flashy new commands, the ones that give you POKEless sprites, easy to program music and sound effects, and hi-res graphics. The glamour of these powerful keywords can easily bewitch a new 128 owner.

Disk commands, on the other hand, are just disk commands. They're mundane. But if you learn about the new ways of loading, saving, and handling files, you'll save a lot of time, time that could be spent programming—or playing with sprites, music, and hi-res graphics.

We'll concentrate on using the 128 disk commands, most of which work equally well on the 1541 disk drive or the new 1571. But we'll also touch briefly on a few of the new 1571 DOS commands.

A Dozen Ways To Load

If you want to load a BASIC program, you have four choices:

1. LOAD *"filename"*,8
2. DLOAD *"filename"*
3. RUN *"filename"*
4. Press SHIFT-RUN/STOP

For machine language or binary files:

5. LOAD *"filename"*,8,1
6. BLOAD *"filename"*
7. BLOAD *"filename"*, B*bank*, P*address*
8. BOOT*"filename"*

From within the machine language monitor:

9. L *"filename"*,8
10. L *"filename"*,8,*address*

Finally, there are two ways to start up auto-boot programs:

11. BOOT
12. Turn on or reset the computer with an autoboot disk in the drive.

Loading BASIC Programs

As in BASIC 2.0, the LOAD command defaults to tape, so you must include the device number when loading from disk. But LOAD should never be necessary when DLOAD and RUN are available.

DLOAD is a new command; the D stands for "Disk" and it defaults to drive 0, device 8. If you own a dual drive, you can add a comma and either D0 or D1 to pick a drive for loading. Unfortunately, 128 owners may never see the 1572 dual drive; as of this writing, Commodore has apparently decided not to manufacture it. You can still add single drives to your system, though. To access a second or third drive, follow DLOAD with a comma and U9, U10, etc. The current device number of the 1571 can be selected by flipping switches on the back. To change to device nine, for example, make sure it's turned off and flip the switch nearest to the cords down. This is much simpler than what's required to modify a 1541, opening it up and cutting a solder trace.

The next command on the list, RUN, has been modified. By itself, it still runs a program, but if you add a program name, the program loads and runs. Like DLOAD and most other disk commands, you can specify a drive number with D or a device number with U after the program name.

In 64 mode, pressing SHIFT-RUN/STOP still loads and runs the first program from tape. But in 128 mode, this combination loads and runs the first program on disk.

BLOADing Binary Files

A binary file is most often a machine language program, although there are several other possibilities: sprite shapes, redefined characters, function key definitions, hi-res pictures, to name just a few. With binary files it's usually important that they load into a specific area of memory.

If you're familiar with the VIC or 64, you'll recognize LOAD*"filename"*,8,1. It loads a file back into the part of memory from which it was saved.

BLOAD does the same thing, but you don't have to include the 8 and the 1. BLOAD can also send a

file to a different section of memory, if you append a B (for Bank number) and a P (Position). With an unexpanded 128, the only two choices for the bank are 0 and 1. BASIC programs are stored in bank 0, variables in bank 1. The position can be any memory location in the range 0–65535.

BOOT *"filename"* loads a machine language program and executes a SYS to the starting address. It's the machine language equivalent of RUN *"filename"* for BASIC programs.

You can also load from within the machine language monitor with the L command. After the filename, you must include a comma and an 8 (for device 8, the disk drive). If you wish to relocate the program to a different section of memory, you can include the new address as well.

Autoboot Sectors

When you first turn on a 128, it checks to see if a disk drive is attached and turned on. If so, it tries to read track 1, sector 0 into memory (the 256 bytes of the boot sector are read into locations $0B00–0BFF). If the letters "CBM" are found at the beginning of that disk sector, the autoboot sequence begins.

You can see how this works by following this power-on sequence:

1. Turn on your TV/monitor and disk drive, but not the 128.

2. Insert the CP/M disk that came with the 128 into the 1541 or 1571.

3. Turn on the 128.

The CP/M disk has an autoboot sector; it's designed to load and run CP/M automatically. An alternative to resetting the computer is to enter BOOT without a filename.

Autoboot sectors aren't limited to CP/M. It's possible to create disks that automatically load and run a BASIC or an ML program. To create such a disk, load and run the AUTOBOOT MAKER program on the disk that comes with the 1571.

The first three bytes of track 1, sector 0 (the characters C, B, and M) are followed by the low byte of the load address, the high byte, the bank number for the load, and the number of sequential disk sectors to be loaded. These four bytes aren't important when you're autobooting BASIC programs, so they should usually be zeros. Starting at the eighth byte, you put the disk name (for the BOOTING message), and end with a zero. Next is the name of the program you wanted to load, again terminated by a zero. Finally, there's machine language which will be called after the load.

Chained Programs

Commodore computers have always had problems with chaining, the process of loading and running one program from within another. The difficulties stemmed from the way variables were stored in memory in previous Commodores: The beginning of variable storage immediately followed the end of the BASIC program.

Chaining is a snap on the 128. Since the program is kept separate from variables, you don't need to worry about program length. To load and run another program, just follow these rules:

1. If you want to keep the variables from the first program, use DLOAD. The second program loads and runs. All variable values are retained.

2. If you want to clear the variables, use RUN *"filename"* where *filename* is the name of the second program.

3. To load a binary file, use either BLOAD *"filename"* or BOOT *"filename."*

A Shortcut

There's a quick and convenient way to DLOAD or RUN a program, if you save it a certain way. Include this line at the beginning of the program you're working on:

```
1 REM      DSAVE "01PROGRAM-
  NAME {SHIFT-SPACE}:
```

The {SHIFT-SPACE} means hold down SHIFT and press the space bar. Play with the spacing of the line so that pressing TAB once puts the cursor in front of DSAVE and pressing it twice lands the cursor on the 1 in front of the program name. When you want to do a safety save of an incomplete program, LIST 1 and TAB twice. Change version number 01 to 02 and press RETURN. Now cursor up to the beginning of the line and TAB once. Tap the ESC key (next to TAB) and then press P. This erases everything from the cursor to the beginning of the line (ESC-Q erases everything to the end of a line, and you can remember these two ESC commands if you mind your p's and q's). Press RETURN and your program is saved to disk with the new version number.

Later, when you come back to work on the program, press f3 to see the directory (if it goes by too fast, the Commodore key slows it down; the NO SCROLL key temporarily pauses it). When you see the latest version, press STOP. Cursor up to the program name and type DLOAD or RUN. Better yet, press f2 (DLOAD) or f6 (RUN). The SHIFT–SPACE in line 1 puts a quotation mark between the program name and the colon. Without the colon, DLOAD or RUN would interpret PRG as part of the command.

Another advantage to including the DSAVE on line 1 is that when you send a program listing to your printer, the version number is right there at the top of the page.

Saving

Here are a few ways to save programs:

1. SAVE*"filename"*,8
2. DSAVE*"filename"*
3. BSAVE *"filename"*, B*bank*, P*start* TO P*end*
4. From the ML monitor: S *"filename"*,8, *start, end+1*

The first two, SAVE and DSAVE, are just ordinary ways to save ordinary BASIC programs. BSAVE and the monitor save are a little more interesting. They save a section of memory as a binary file. Note that when you're in the monitor, you have to add 1 to the ending address of the memory being saved.

You might think these two methods would be most useful for saving ML programs. They are good for that, of course, but there are also several areas of memory you may want to BSAVE for use in a BASIC program:

$0E00–$0FFF Sprite definitions
$1000–$10FF Ten function key definitions
$1C00–$3FFF Hi-res screen

The addresses are listed in hexadecimal. To convert to decimal, use the DEC function (PRINT DEC("0E00") for example).

If you create several sprites

with SPRDEF for a game, you can BSAVE the sprite area to disk. In the game, you would then BLOAD them back into memory. This works a lot faster than POKEing them into memory or reading a sequential file, especially if you're using a 1571.

In case you're wondering about the reference above to ten function keys, yes, there are ten redefinable keys. There are the eight you can define with the KEY command (labeled f1–f8), but also SHIFT–RUN/STOP and HELP. If you go into the monitor and do a memory display of 1000–10FF, you can see the ten key definitions. The first ten bytes in this area list the length of each function key. The rest are the actual characters that print when you press one of them. The number 13 is ASCII for a carriage return, the equivalent of pressing the RETURN key. After redefining the keys, you can BSAVE their new values. To retrieve the previous key definitions, use BLOAD.

Handling Sequential Files

DOPEN and DCLOSE are new ways of establishing and breaking connections with a sequential file. There's not much to say about them; if you already know how to OPEN and CLOSE sequential files, you'll catch on quickly. The difference in syntax is illustrated below:

```
OPEN 3,8,4,"filename,S,W"
DOPEN#3,"filename",W
```

Note that DOPEN doesn't need as much information as OPEN. OPEN is a general-purpose command; it can set up a logical file to a disk file, a tape file, a printer, a modem, and so on. DOPEN, on the other hand, is for disk files only. So OPEN needs the device number and disk channel (,8,4), but DOPEN doesn't. The S after the file name indicates that a sequential file will be opened. Since DOPEN defaults to sequential files, it too is unnecessary. Also, note that the W for Write is outside the quotation marks in the second example.

APPEND is a variation on DOPEN. It opens an already existing disk file for a write operation. Any information written to the sequential file is added to the end. Data at the beginning of the file is safe and unchanged.

There aren't any new ways of reading or writing files. You still PRINT# to send data and either INPUT# or GET# to read a file.

Relative Files Are Much Easier

Being able to randomly access records in a file can sometimes greatly speed up a program. With sequential files, you may sometimes have to read through 50 records just to get to the 51st. A relative file allows you to obtain the information you need almost immediately.

In BASIC 2.0, creating and maintaining a relative file requires sending a number of CHR$ codes. If you write programs for relative files in 64 mode, you'll have to learn the complexities of relative files. But not on the 128. In just a few lines, you can open and write to a relative file. Let's say you wanted 100 records with 20 characters in each record. Your program to set up a file would look something like this:

```
10 DOPEN#3,"XYZFILE",L20
20 RECORD#3,100
30 PRINT#3,"LAST RECORD"
40 RECORD#3,100
50 CLOSE3
```

That's all there is to it. When DOPEN is followed by an L and a number, it opens a relative file. The length of each record is set by L20. Records can be from 1 to 254 bytes long. Because the record length is stored in the directory, you need to use the L parameter only when the file is first created.

RECORD# positions the pointer to the desired record (up to 65535 can be accessed, depending on the record length). You must include the logical file number and the record number. A third number can be added if you want to start reading or writing partway into the record. If this number is omitted, you'll begin at the first byte of the record.

In line 30, we PRINT# to record number 100. Printing to a previously nonexistent record forces the disk drive to create that record and all previous records. Line 40 positions the pointer again, to avoid a rare bug that sometimes corrupts files and then file three is closed. (See "Relative Files: Speed And Economy" in the June 1985 issue for more about the 64's relative file bug.)

Once the file is created, you can easily access records with DOPEN and RECORD#. You PRINT# to write and either GET# or INPUT# to read records.

Utilities

There are more new commands that help when you're programming. The f3 key is defined to print DIRECTORY. So, with the press of a single key, you can see what's on a disk.

Two very useful reserved variables are DS (short for Disk Status) and DS$. The first returns the disk error number, the second prints out the error message. If the red light on a 1541 starts flashing (the green light on a 1571), just enter PRINT DS$ and you can see what went wrong. Consult your disk drive manual for a complete list of error messages.

Within a program, DS is usually more helpful than DS$. After a disk operation, add a line **IF DS>19 THEN 500**, where line 500 is the beginning of an error-handling routine.

The variable DS will normally hold a 0 if no errors occurred. But if DS is equal to 20 or more, something has gone wrong. There are a few exceptions, though: Error 01 is not an error, it's triggered after a SCRATCH operation. The error message will be FILES SCRATCHED, followed by a comma and the number of files that were scratched. Error 50 (RECORD NOT PRESENT) is no matter for concern if you've just created or expanded a relative file. If you write to a previously nonexistent record in a relative file, it's added to the disk. The record was not present before the operation and thus causes the error 50. Finally, when you first turn on or reset a disk drive, you'll receive an error 73, which is simply an announcement of which version of DOS is inside the drive.

Several other new commands make file management easier. RENAME and SCRATCH are fairly straightforward. SCRATCH is followed by a filename inside quotation marks. Pattern matching, using wild cards like question marks or asterisks, is available for those

times when you want to scratch several files with similar names. To change the name of a file, RENAME *"oldname"* TO *"newname."* This syntax is certainly easier to remember than OPEN 15,8,15, "R0:*newname=oldname,*" the required syntax on the VIC or 64.

COLLECT validates the disk. It's used mostly for cleaning up the Block Allocation Map (BAM) to get rid of improperly closed files. These were formerly called "poison files," but the 1571 disk drive manual refers to them as "splat files." They're marked by an asterisk in the directory, *PRG, for example.

DCLEAR initializes the disk; it's the same as sending "I0" to channel 15.

CONCAT combines the contents of two sequential files. You can use it on program files, but the result won't be a merged program because the two zeros that mark the end of a BASIC program get in the way.

Two disk commands designed primarily for dual drives are COPY and BACKUP. The first copies a file from one drive to another. But you must use a dual drive—COPY won't work with two single drives. It can also make a copy to the original disk (if you want to rearrange a directory, for example). BACKUP copies a whole disk. It too requires a dual drive.

A Few Quirks

There are a few annoying features of the 128—not bugs, just bothersome quirks.

The most serious of these is that SHIFT–RUN/STOP loads and runs the first file on disk. A nice feature if that's what you want, but sooner or later, while programming, you'll accidentally press SHIFT-LOCK and RUN/STOP or the Commodore key and RUN/STOP. When the disk drive starts spinning, you have only a few seconds to unlock the SHIFT-LOCK key and press STOP to prevent the first program from loading. If you fail to stop it, the program loads and runs and you've lost any part of your other program that was not saved. To avoid this situation, you may want to put a sequential file at the beginning of a disk. If you accidentally type SHIFT–RUN/STOP, the computer will try to load the sequential file, but it won't work. The program you're working on will be safe if this precaution is taken.

You can also accidentally save a program. The default values for f7 and f3 are LIST and DIRECTORY. Very helpful when you want to take a look at what's on a disk or what's in a program. But in between these two keys is f5, which is defined as DSAVE. If you reach up to list a program and accidentally press f5 and f7, the computer will print DSAVE"LIST and begin saving your program under that name.

VERIFY and DVERIFY don't always work as you would expect. Each line of a BASIC program contains a memory pointer to the beginning of the next line. When you allocate a graphics area, the BASIC program is moved up by 9K and all the line links change. Line links that don't match will lead to a false VERIFY ERROR. You can test this by entering a one line program and saving it to disk. Now type GRAPHIC1: GRAPHIC0 to allocate a graphics area. List the program and use DVERIFY to check your save. You should see an error message.

Something to remember when you're using disk commands is that variables must be enclosed in parentheses. The following two examples show the right and wrong ways to use variables:

```
RENAME H$ TO "FINALFINAL": REM
  WRONG
RENAME (H$) TO "MOSTRECENT":
  REM CORRECT
```

Another minor annoyance is that large relative files have a limit of 720 disk sectors. Relative files contain up to six side sectors which can keep track of 120 sectors each. A formatted 1541 disk has 664 blocks free, so you'll run out of disk space before you reach the 720 sector limit. But the 1571 formats both sides of a disk, for 1328 blocks free. It's unfortunate that you can't use all of that space for a relative file. You're limited to about 180K per file. The 720 sector limit gets in the way.

How Fast Is The 1571?

If you already own a 1541 drive, you can use it with a 128. You don't need to buy a 1571, unless speed is important. Here's how the two drives compare:

	1541	1571
9K LOAD (hi-res screen)	27 seconds	4 seconds
Disk format	89 seconds (one side)	43 seconds (two sides)
Quick format (no ID)	2.5 seconds (one side)	3.4 seconds (two sides)

Going into 80 columns and using the FAST command to double the speed of the microprocessor saves only a few tenths of a second on disk operations. So the speed of the computer is not a factor. The bottleneck is the speed at which the data travels through the serial cable.

Note that formatting, which is handled completely within the disk drive, is twice as fast for twice the disk capacity. This suggests that writing operations are quicker on the 1571.

Even when you send the command to make the 1571 act like a 1541, it's faster. A 1541 takes nearly a minute and a half to format a disk. The 1571 in 1541 mode takes only one minute and twelve seconds.

The "act like a 1541" command is **OPEN 15,8,15: PRINT#15, "U0>M0"**. To reset to 1571 mode, **PRINT#15, "U0>M1"** (these commands can be used in 64 mode as well).

While the 1571 is emulating the 1541, you can choose which read/write head is used with PRINT#15, "U0>H0" or **PRINT#15, "U0>H1."** By switching heads, you can format both sides of a disk as if they were separate disks. This isn't especially useful, but it suggests a solution for the 720 sector limit on relative files. You could format both sides of the disk with separate names and IDs and then create a relative file on each side. Within the program, you'd need to figure out which side of the disk contains the information and switch back and forth. You might lose some time in the head switching, but you'd be able to expand a relative file to about 330K.

Another plus for the 1571 is its ability to read a variety of CP/M formats. If you plan to do much with CP/M, the 1571 provides more flexibility. Even if you don't, it's faster and can handle more data than the 1541.

news & products

StealthTec Transparent Commodore Utilities

Cardco, Inc., is introducing two new utilities for the Commodore 64 (128 versions to follow soon), based on the company's new *StealthTec* transparent program interrupt technology. A transparent interrupt mechanism is one that can be called upon, used, and removed during the execution of another program without disturbing any aspect of the main program.

The first package, *Freeze Frame*, is a totally transparent screen dump utility. With a couple of keystrokes, it sends whatever is on the screen to the printer. Unlike other screen dump utilities, *Freeze Frame* works on virtually all programs and all programming languages; it also supports any printer or printer interface which emulates the Commodore 1525 printer, as well as any Epson-compatible or any Okidata-compatible printers.

Cardco is also introducing a business/productivity utility that offers 64 owners utilities similar to those in the popular Borland International *Sidekick* product for IBM PCs. Included will be a calculator, an appointment calendar, a telephone directory/database, a memo writer, a screen dump utility, access to all DOS functions, and other features.

The productivity utility package (name to be announced soon) has a suggested retail price of $69.95. *Freeze Frame* is priced at $49.95. Both programs should be available in early 1986.

Cardco, Inc., 300 S. Topeka, Wichita, KS 67202.

Circle Reader Service Number 227.

Bridge Packages For The 64

Noted computer bridge authority Thomas Throop has developed a trio of computer bridge games for the Commodore 64, available from his company Great Game Products. *Bridge Baron* ($39.95), winner of the First Computer Bridge Tournament, plays the complete game of bridge. The program lets you bid, play, or bid and play over a million computer generated deals. You can also add your own deals. And the program knows five card major opening bids, as well as the Stayman, Blackwood, and Gerber conventions.

Play Bridge with Sheinwold ($29.95) offers you 91 deals designed by bridge expert Alfred Sheinwold. The player has three opportunities to choose the recommended play. *Improve Your Bridge with Blackwood* (which should be available in Spring 1986 for $39.95), developed with renowned bridge authority Easley Blackwood, teaches the fundamentals of good declarer play as well as some advanced techniques.

Great Game Products, 8804 Chalon Dr., Bethesda, MD 20817.

Circle Reader Service Number 228.

128 Monochrome Adapter

Batteries Included has introduced the BI C128 Monochrome Adapter for the Commodore 128. This monitor cable allows you to use the 128's 80-column display with color or monochrome monitors, such as the Commodore 1701 and 1702 composite monitors. The plug connects to the RGBI port on the 128 and to the LUMA socket on the rear of the 1701 and 1702. On other monitors, the cable would connect to the video-in port. Suggested retail price is $7.95.

Batteries Included, 30 Mural St., Richmond Hill, Ontario, Canada L4B 1B5 or 17875 Sky Park North, Suite P, Irvine, CA 92714.

(For the names of other companies with 128 video adapters, see "The Well-Connected Computer" in this issue.)

Circle Reader Service Number 229.

Investment Package And Books For 64

Abacus Software has announced the release of *Personal Portfolio Manager*, an investment management program for stocks and bonds. Available for the 64 and 128 (in 64 mode), *Personal Portfolio Manager* lets you manage stocks, bonds, mutual funds, treasury bills, and similar investments; record taxable or non-taxable dividends or interest income; reconcile each brokerage account cash balance with year-to-date transactions; produce reports; and enter stock quotes manually or automatically through Dow Jones or Warner services. The suggested retail price is $39.95.

Among other releases from Abacus are two books, *1541 Repair & Maintenance Handbook*, which covers disk drive maintenance, testing adjustments, read/write head tuning, and drive motor speed adjustment, among other topics; and *CAD Book for the C-64 and 128*, which provides information about computer-aided-design with Commodore computers (and Commodore computers using *Simons' BASIC*). Included are programs for developing a CAD system and for experimenting with CAD. The books sell for $19.95 each.

Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510.

Circle Reader Service Number 230.

Acrojet Flight Simulator

Three-dimensional perspective and sophisticated navigation instrumentation are featured in *Acrojet*, a new jet flight simulator from MicroProse. Using a joystick, players can perform rolls, loops, Immelmann turns, and other maneuvers.

One to four players can compete in a Decathlon of Sport Aviation for the World's Greatest Sport Pilot title. Players compete against one another and Major Bill, a fighter pilot.

Suggested retail price is $34.95.

MicroProse Software, 120 Lakefront Dr., Hunt Valley, MD 21030.

Circle Reader Service Number 231.

Kimber-Link Telecommunications Program

Kimbertek, Inc., has introduced *Kimber-Link*, a telecommunications package for the Commodore 64 that lets you communicate with other 64s, most minicomputers, mainframes, information services like CompuServe, and bulletin boards. The program works with many kinds of modems (including auto-dial), contains a 30,000-character buffer for

data transfer and capture, and operates with most brands of printers. The package also contains a keyboard overlay for ease of use, and comes with a 48-page manual. *Kimber-Link* lets you store all variable parameters for custom-tailored set-ups, and then reloads them whenever you use the program.

The price is $29.95 (plus $3 shipping and handling). Pennsylvania residents must add six percent sales tax.

Kimbertek, Inc., P.O. Box 743, Phoenixville, PA 19460.

Circle Reader Service Number 232.

Printer Re-Inkers

New life for fading computer printer ribbons is available from Computer Friends, developers of the Mac Inker UC (Universal Cartridge) for almost all fabric ribbon cartridges and the Mac Inker US (Universal Spool) for all fabric ribbon spools (up to one inch in width and up to four inches in diameter). Ribbons are loaded onto the Mac Inker table and wound around an inking element. A few drops of ink are added to the ink reservoir, and the ribbon is then passed around the inking element for even ink distribution. The re-inkers work with both dot matrix and daisy wheel printers.

Suggested retail price for the Mac Inker UC is $60; for the Mac Inker US, $66.95. Two-ounce bottles of ink are available for $3.00; pints for $18.50. (There is a $3 shipping and handling charge.)

Computer Friends, 6415 SW Canyon Ct., Suite #10, Portland, OR 97221.

Circle Reader Service Number 233.

SpeedScript Enhancer

SPEEDPAK, an enhancement program for use with the *SpeedScript* word processor (versions 3.0–3.2), adds six new commands, three printer codes, and eight user-definable 31-character macro phrase keys. Among the features for use with *SpeedScript* are alternate screens (allows you to edit and switch between two documents), help screen and onscreen font installer (four of each), encryption (32-character secret code), code conversion (to Commodore ASCII or screen codes), default selection (to disk/tape storage, set printer device and secondary address), and a Dvorak keyboard option. Three additional printer codes work with the alternate screen to provide a RAM-based form letter mail merge capability.

The package, priced at $15, includes three disk-based tutorials and three sample files.

Upstart Publishing, Dept. SP-NP2, P.O. Box 22022, Greensboro, NC 27420.

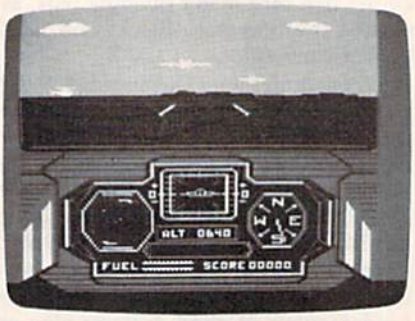
Circle Reader Service Number 234.

Jet Fighter Game

Flyer Fox is a new jet fighter action game from Tymac that puts you in the pilot's seat, defending international skies from Mig fighters. The game offers full view of the cockpit and three window views. In addition to music and sound effects, *Flyer Fox* contains software-generated speech. The game is joystick-controlled and is available on disk and tape.

Suggested retail is $39.95.

Tymac Controls Corporation, 127 Main St., Franklin, NJ 07416.



The view from the cockpit in Tymac's Flyer Fox.

Circle Reader Service Number 235.

Chris Evert-Lloyd On The 64

Avant-Garde Publishing has introduced a tennis training guide featuring tennis great Chris Evert-Lloyd. Demonstrations of grip, stroke, game strategy, and specialized exercises are used to teach both fundamental and advanced techniques. Also covered are equipment, game rules, and improving concentration. The game uses live-action color graphics, and includes a test match for trying out the various techniques.

Previous Avant-Garde releases include *Dave Winfield's Batter Up!* and *Joe Theismann's Pro Football*. Suggested retail price for *Chris Evert-Lloyd Tennis* is $34.95.

Avant Garde Publishing Corp., 37B Commercial Blvd., Novato, CA 94947.

Circle Reader Service Number 236.

Talking Terminal

A new telecommunications package from Welwyn Currah, called the Intelligent Talking Terminal, enables you to receive modem-transmitted data verbally or as text on screen. Compatible with either the Commodore 64 or 128, the package includes the Voice Messenger speech synthesizer, a telecommunications program, and *Easy Speech*, a program that enables most pre-existing text-driven software to speak.

The program can be used to hear messages, games, or information from subscription services such as The Source or CompuServe. The package sells for $29.95.

Welwyn Currah, 104 W. Fourth St., Royal Oak, MI 48067.

Circle Reader Service Number 237.

Three From SSI

Strategic Simulations, Inc., has announced the release of three new strategic war games for the 64. *Battle of Antietam* ($49.95) recreates the famous civil war battle; *Norway 1985* ($34.95), the fourth game in the "When Superpowers Collide" series by Roger Keating, simulates the Soviet occupation of Norway and NATO's counterattack; *United States Army Air Force* ($59.95) is an advanced simulation of daylight bombing of German industry from 1943–45, featuring 24 aircraft types. Each game can be played with one or two players.

Strategic Simulations Inc., 883 Stierlin Rd., Bldg. A-200, Mountain View, CA 94043-1983.

Circle Reader Service Number 238.

64 Modem Software

Sixth Sense, a new telecommunications program from Microtechnic Solutions, comes with programmable macro keys that enable many unattended modem operations. The macro keys are easily programmed with a set of macro templates. Among the other functions included in *Sixth Sense* are multiple data paths, split-screen line input, a 700-line virtual screen, and a user-programmable counter.

Suggested retail price for *Sixth Sense* is $89.95; or $71.95 for those who already have the Smart 64 Terminal. An additional $9 can be deducted for prepaid orders.

Microtechnic Solutions, Inc., P.O. Box 2940, New Haven, CT 06515.

Circle Reader Service Number 239.

MasterType's Writer

A sophisticated word processor, *MasterType's Writer*, has been released from Scarborough Systems. The program features dual windows for outlining text, color highlighting, multiple typefaces, macro commands for frequently used words and phrases, and an on-disk tutorial. A print preview option is included, and linked files can be printed out.

MasterType's Writer is available for the Commodore 64 for $44.95.

Scarborough Systems, Inc., 55 S. Broadway, Tarrytown, NY 10591.

Circle Reader Service Number 240.

How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, 16, and VIC-20. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then back on, erasing whatever was in memory. So be sure to *save a copy of your program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

When You Read:	Press:	See:
[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

The New Automatic Proofreader

Philip I. Nelson, Assistant Editor

Now it's easier than ever to type in and enjoy programs for Commodore computers. This completely new version of "The Automatic Proofreader" works on all eight-bit Commodores (the 128, 64, Plus/4, 16, and VIC-20) and alerts you to almost every typing mistake you might make. It can even be used with other programming utilities like "MetaBASIC" and the "DOS Wedge."

"The New Automatic Proofreader" helps you type in program listings without typing mistakes. It's a short error-checking program that conceals itself in memory and adheres to your Commodore's operating system. Each time you press RETURN to enter a program line, the Proofreader displays a two-letter checksum in reverse video at the top of your screen. If the checksum on your screen doesn't match the one in the printed listing, you've typed the line incorrectly—it's that simple. You don't have to use the Proofreader to enter printed listings, but doing so greatly reduces your chances of making a typo.

Getting Started

First, type in the Commodore Automatic Proofreader Program *exactly* as it appears in the listing. Since the Proofreader can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands or you think they don't apply to your computer. As soon as you're finished typing the Proofreader, save at least two copies on disk or tape before running it the first time. This is very important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language (ML) portion in memory.

When that's done, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader installs the ML routine in memory, displays the message PROOFREADER ACTIVE, erases the BASIC portion of itself, and ends. If you type LIST and press RETURN, you'll see that no BASIC program remains in memory. The computer is ready for you to type in a new BASIC program.

Entering Programs

Once the Proofreader is active, you can begin typing in a BASIC program as usual. Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum (reverse video letters) in the upper left corner of the screen. Compare this checksum with the two-letter checksum printed to the left of the corresponding line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces that aren't enclosed in quotation marks, so you can omit spaces (or add extra ones) between keywords and still see a matching checksum. For example, these two lines generate the same checksum:

```
10 PRINT"THIS IS BASIC"
10 PRINT          "THIS IS BASIC"
```

However, since spaces inside quotation marks are almost always significant, the Proofreader pays attention to them. For instance, these two lines generate different checksums:

```
10 PRINT"THIS IS BASIC"
10 PRINT"THIS ISBA    SIC"
```

A common typing mistake is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. A checksum program that adds up the values of all the characters in a line can't possibly detect transposition errors (it can only tell whether the right characters are present, regardless of what order they're in). Because the Proofreader computes the checksum with a more sophisticated formula, it is also sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line with the Proofreader: Simply LIST the line after typing it, move the cursor back onto the line, and press RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly.

The same technique works for rechecking a program you've already typed in: Reload the program, LIST several lines on the screen, and press RETURN over them.

If you're using the Proofreader on the Commodore Plus/4, 16, or 128 (in 128 mode), *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you run any program that contains a GRAPHIC command. The Proofreader deallocates any graphics areas before installing itself in memory, but you are responsible for seeing that the computer remains in this configuration.

Though the Proofreader doesn't interfere with other BASIC operations, it's always a good idea to disable it before running any other program. Some programs may need the space occupied by the Proofreader's ML routine, or may create other memory conflicts. However, the Proofreader is purposely made difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP–RESTORE. The simplest way to disable it is to turn the computer off, then on again. A gentler method is to SYS to the computer's built-in reset routine. Here are the SYS statements required for various Commodore computers:

Computer	Reset Command
128	SYS 65341
64	SYS 64738
Plus/4	SYS 65526
16	SYS 65526
VIC-20	SYS 64802

These reset routines erase the BASIC program currently in memory, so be sure to save the program you're typing before entering the SYS command.

Inside The Proofreader

Writing a machine language program that works on five different computers is no small task. The first hurdle is finding a safe place to put the code. Though the cassette buffer is an obvious choice, it's located in different places on various machines, and putting ML there creates problems for tape users. Instead, the Proofreader uses 256 bytes of BASIC programming space.

Before it installs the routine in memory, the Proofreader checks which computer you're using. Then it stores the ML at the bottom of BASIC memory and protects itself by moving the computer's start-of-BASIC pointer to a spot 256 bytes higher in memory. Once that's done, the Proofreader activates the ML routine and performs a NEW to erase itself. Note that because the Proofreader overwrites its first few BASIC lines, it's critical not to delete anything from the first portion of the program.

The ML portion of Proofreader wedges into one of the operating system's built-in routines (CRUNCH). The system calls CRUNCH every time you enter a line from the keyboard (it can be a numbered program line, or a direct command without a line number). Before the computer digests the line, it uses CRUNCH to convert BASIC keywords like PRINT into *tokens*—one- or two-byte numbers that represent the keyword. By changing the CRUNCH vector to point to our ML checksum routine, we can make the computer figure the checksum before it tokenizes the line with CRUNCH.

The checksum routine initially sets the checksum to equal the low byte and high byte values of the current line number. Then it scans the line, multiplying the ASCII value of each character by its position in the line and adding the result to the two-byte checksum as it moves down the line. After the whole line has been scanned, the Proofreader performs an *exclusive or* operation on the two bytes of the checksum and displays the final result as two alphabetic characters in reverse video. Though the final checksum could have been displayed as a two-digit hexadecimal number, the Proofreader uses letters so that no harm will be done if you accidentally press RETURN over the line containing the checksum. Once this is done, we restore everything to normal and jump to CRUNCH, which handles the line as usual.

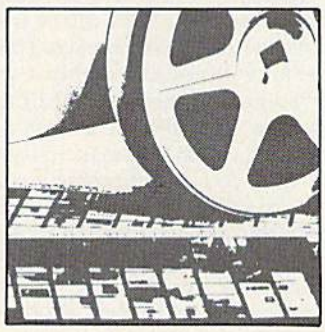
Compatibility

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and you activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader. Both programming aids are now available.

When using the Proofreader with another utility, you should disable both programs before running a BASIC program. MetaBASIC's QUIT command turns both utilities off (to get them back, you must start over from the beginning). While the Proofreader seems unaffected by programs like "Automatic Syntax Checker" and "BASIC Aid," there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities you activate, the more fragile the system becomes, so you must exercise common sense. Any program that disturbs the CRUNCH vector or the memory area where the Proofreader resides will probably crash the system without delay.

See program listing on page 116.

This Publication is available in Microform.



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MLX Machine Language Editor For The Commodore 64

Ottis Cowper
Technical Editor

"MLX" is a labor-saving utility that will help you enter machine language program listings without error. MLX is required to enter all Commodore 64 machine language programs published in COMPUTE!'s GAZETTE. This version of MLX was first published in the January 1986 issue; it cannot be used to enter MLX programs published prior to that date, nor can earlier versions of MLX be used to enter the listings in this issue.

Type in and save a copy of MLX. You'll need it for all future machine language programs in COMPUTE!'s GAZETTE, as well as machine language (ML) programs in our companion magazine, COMPUTE!, and COMPUTE! books. When you're ready to enter an ML program, load and run MLX. It asks you for a starting and ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing. If you're unfamiliar with ML, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, MLX offers the option of clearing the workspace. The data you enter with MLX is kept in a special reserved area of memory; clearing this workspace area fills the reserved area with zeros, which will make it easier to find where you left off typing if you enter the listing in several sessions. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session there's no point in clearing the workspace, since the data you load in will fill the area with whatever values were in workspace memory at the time of the last Save.

At this point, MLX presents a menu of commands:

Enter data
Display data
Load data
Save file
Quit

Press the corresponding key to select a menu option. These commands are available only while the menu is displayed. You can get back to the menu from most options by pressing RETURN.

Entering A Listing

To begin entering data, press E. You'll be asked for the address at which you wish to begin. (If you pressed E by mistake, you can return to the command menu by pressing RETURN.) When you begin typing a listing, enter the starting address here. If you're typing in a long listing in several sessions, you should enter the address where you left off typing at the end of the previous session. In any case, make sure the address you enter corresponds to the address of a line in the MLX listing. Otherwise, you'll be unable to enter the data correctly.

After you enter the address, you'll see that address appear as a prompt with a nonblinking cursor. Now you're ready to enter data. To help prevent typing mistakes, only a few keys are active, so you may have to unlearn some habits. MLX listings consist of nine columns of two-digit numbers—eight bytes of data and a checksum. You *do not* type spaces between the columns; the new MLX automatically inserts these for you. Nor do you press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit. The only keys needed for data entry are 0–9 and A–F. Pressing most of the other keys produces a warning buzz.

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line badly, press CLR/HOME to start the line over. The RETURN key is also active, but only *before* any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

Beep Or Buzz?

After you type the last digit in a line, MLX calculates a checksum from the line number and the first eight columns of data, then compares it with the value in the ninth column. The formula (found in lines 370–390 of the MLX program) catches almost every conceivable typing error, including the transposition of numbers. If the values match, you'll hear a pleasant beep, the data is added to the workspace area, and the prompt for the next line of data appears (unless the line just entered was the last line of the listing—in which case you'll automatically advance to the Save option). But if MLX detects a typing error, you'll hear a low buzz and see an error message. Then MLX redisplays the line for editing.

To edit a line, move the cursor left and right using the cursor keys. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. To make corrections in a mistyped line, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Other MLX Functions

The Display data option lets you review your work. When you select D, you'll be asked for a starting address. (As with the other menu options, pressing RETURN at this point takes you back to the command menu.) Make sure the address corresponds to a line from the listing. You can pause the scrolling display by pressing the space bar. (MLX finishes printing the current line before halting.) To resume scrolling, press the space bar again. The display continues to scroll until the ending address is reached, then the menu reappears. To break out of the display and return to the menu before the ending address is reached, press RETURN. A quick way to check your typing is to compare the reverse video checksums on the screen with the data in the rightmost column of the printed listing. If the values match, you can be sure the line is entered correctly.

The Save and Load menu options are straightforward. First, MLX asks for a filename. (Again, pressing RETURN at this prompt without entering anything returns you to the command menu.) Next, MLX asks you to press either T or D for tape or disk. If you notice the disk drive starting and stopping several times during a load or save,

don't panic; this behavior is normal because MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. For disk, the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. (This also precludes the use of @ for Save-with-Replace, so remember to give each version saved a different name.) MLX saves the entire workspace area from the starting to ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports any errors detected during the save or load. (Tape users should bear in mind that the Commodore 64 is never able to detect errors when saving to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you originally specified. If you get one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct ending address.

The Quit menu option has the obvious effect—it stops MLX and enters BASIC at a READY prompt. Since the RUN/STOP key is disabled, Q lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading the finished product varies from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. (Such programs usually have 0801 as their MLX starting address.) Others must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. (On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000.) In any case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

By the time you finish typing in the data for a long ML program, you'll have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type in MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. (Incidentally, MLX is included every month on the GAZETTE DISK.) Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in MLX cost you several nights of hard work.

MLX

For instructions on entering this listing, refer to "How To Type In COMPUTE!'s GAZETTE Programs" elsewhere in this issue.

```
EK 100 POKE 56,50:CLR:DIM IN$,
       I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
       4=254:Z5=255:Z6=256:Z7=
       127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
       :BS=PEEK(55)+Z6*PEEK(56
       ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
       :S$=" ":D$=CHR$(20):Z$=
       CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
       +23:POKE I,0:NEXT:POKE
       {SPACE}SD+24,15:POKE 78
       8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
       R$(8):POKE 53280,15:POK
       E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}§8 @3
       {2 SPACES}"SPC(28)"
       {2 SPACES}{OFF}{BLU} ML
       X II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
       RESS§4?";:GOSUB300:SA=A
       D:GOSUB1040:IF F THEN18
       0
GF 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS§4?";:GOSUB
       300:EA=AD:GOSUB1030:IF
       {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
       R WORKSPACE [Y/N]§4?";A
       $:IF LEFT$(A$,1)<>"Y"TH
       EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
       ING...";:FORI=BS TO BS+
       EA-SA+7:POKE I,0:NEXT:P
       RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU {DOWN}§4?":
       PRINT T$"{RVS}E{OFF}NTE
       R DATA"
ED 230 PRINT T$"{RVS}D{OFF}ISP
       LAY DATA":PRINT T$"
       {RVS}L{OFF}OAD DATA"
JS 240 PRINT T$"{RVS}S{OFF}AVE
        FILE":PRINT T$"{RVS}Q
       {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
       MID$("EDLSQ",I,1)THEN A
       =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
       90,700,280:GOSUB1060:GO
       TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
       T"{DOWN}§4?ARE YOU SURE
        [Y/N]";A$:IF LEFT$(A$,
       1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
       LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
       =MID$(IN$,3):GOSUB320:A
       D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
       $(B$,J,1):B=ASC(A$)-C4+
       (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
       0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
       H$,B+1,1);:B=A-B*C6:PRI
       NT MID$(H$,B+1,1);:RETU
       RN
RR 360 A=INT(AD/Z6):GOSUB350:A
       =AD-A*Z6:GOSUB350:PRINT
       ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
       CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       §4?";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
```

```
      UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
      :J=2-J:IF J THEN PRINT
      {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
      {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
      {5 RIGHT}";:INPUT#3,IN$
      :IF IN$=N$ THEN CLOSE3:
      GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
      MID$(IN$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
      SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE
      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
      INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
      ,15,"I0:":B=EA-SA:IN$="
      0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
      OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
KH 830 FOR I=0 TO B:GET#1,A$:P
      OKE BS+I,ASC(A$+Z$):IF
      {SPACE}ST AND(I<>B)THEN
       F=2:AD=I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
      >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
       CLOSE1:CLOSE15:GOSUB10
      60:PRINT"{RVS}ERROR: "A
      $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
      187,PEEK(FA+3):POKE188,
      PEEK(FA+4):IFOP=0THEN92
      0
HJ 890 SYS 63466:IF(PEEK(783)A
      ND1)THEN GOSUB1060:PRIN
      T"{DOWN}{RVS} FILE NOT
      {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
      30):IF AD<>SA THEN F=1:
      GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
      2)-1:F=F-2*(A<EA)-3*(A>
      EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
      OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
      UB1010:ON OP GOTO950:SY
      S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
       SAVE COMPLETED **":GOT
      O220
AX 950 POKE147,0:SYS 63562:IF
      {SPACE}ST<>64 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
       LOAD COMPLETED **":GOT
      O220
DP 970 GOSUB1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[4]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
      1050
HA 1040 IF(AD>511 AND AD<40960
      )OR(AD>49151 AND AD<53
      248)THEN GOSUB1080:F=0
      :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
      {SPACE}INVALID ADDRESS
       {DOWN}{BLK}":F=1:RETU
      RN
AR 1060 POKE SD+5,31:POKE SD+6
      ,208:POKE SD,240:POKE
      {SPACE}SD+1,4:POKE SD+
      4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
      TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
      240:POKE SD,0:POKE SD+
      1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
      KE SD+4,0:POKE SD,0:PO
      KE SD+1,0:RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Custom Labels

Article on page 97.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
GS 10 POKE53280,2:POKE53281,15
XE 20 PRINT"{CLR}{BLK}
      {10 DOWN}{2 SPACES}PRESS
       {RVS}1{OFF} FOR GRAPHIC
      S LABELS{2 DOWN}"
RJ 30 PRINT"{2 SPACES}PRESS
      {RVS}2{OFF} FOR ENHANCED
       PRINTING LABELS"
HQ 40 GETP$:P=VAL(P$):IFP<1ORP
      >2THEN40
RS 50 PRINT"{CLR}":GOSUB630:X$
      ="{RVS}{40 SPACES}"
KJ 60 PRINT"{HOME}{RED}
      {8 DOWN}";:FORI=8TO12:PR
      INTX$;:NEXT:PRINT"{OFF}
      {BLK}"
HS 70 IFP=2THENPRINT"{HOME}
      {9 RIGHT}{RED}{RVS}
      {2 SPACES}{OFF}"
EK 80 PRINT"{HOME}{RVS}{RED}
      {OFF}{BLK}":GOSUB680:PRI
      NTCP$"{3 SPACES}(1)
      {2 SPACES}DESIGN A SPECI
      AL LABEL"
JR 90 PRINT"{DOWN}{3 SPACES}(2
      ){2 SPACES}LOAD A LABEL
      {SPACE}FROM DISK":PRINT"
      {DOWN}{3 SPACES}(3)
      {2 SPACES}CHANGE THE LAB
      EL ABOVE
ER 100 PRINT"{DOWN}{3 SPACES}(
      4){2 SPACES}SAVE THE LA
      BEL ABOVE TO DISK"
SQ 110 PRINT"{DOWN}{3 SPACES}(
      5){2 SPACES}PRINT THE L
      ABEL ABOVE":PRINT"
      {DOWN}{9 SPACES}{RVS}EN
      TER YOUR CHOICE{OFF}
KR 120 GETM$:M=VAL(M$):IFM<1OR
      M>5THEN120
GH 130 ONMGOTO550,460,550,370
XH 140 REM * PRINT ROUTINE *
EK 150 GOSUB680:PRINTCP$"
      {3 DOWN}POSITION THE LA
      BEL IN THE PRINTER SO"
HS 160 PRINT"THAT THE TOP OF T
      HE LABEL IS AT THE TOP"
DE 170 PRINT"OF THE PRINTHEAD
      {SPACE}AND PRESS RETURN
      ."
MR 180 GETX$:IFX$<>CHR$(13)THE
      N180
FE 190 OPEN3,3:OPEN4,4:OPEN6,4
      ,6:PRINT#6,CHR$(12):Y=4
HK 200 IFP=1THENX=1026:FORI=0T
      O7:FORJ=3TO38
RF 210 IFP=2THENX=1035:FORI=0T
      O7:PI$=CHR$(14):FORJ=12
      TO29
```

```
FG 220 SI=PEEK(X):IFSI<128ANDY
       =3THENY=2
DC 230 IFSI>127ANDY=4THENY=1
AA 240 IFSI>127THENSI=SI-128
FA 250 IFSI=127THENSI=191:GOTO
       250
MP 260 IFSI>95THENSI=SI+32
KK 270 IFSI>63THENSI=SI+32
JF 280 IFSI<32THENSI=SI+64
AM 290 SI$=CHR$(SI):IFY=1THENS
       I$=CHR$(18)+SI$:Y=3
FS 300 IFY=2THENSI$=CHR$(146)+
       SI$:Y=4
GS 310 PI$=PI$+SI$:X=X+1:NEXT
GB 320 PRINT#4,CHR$(15)PI$CHR$
       (8):PI$="":IF P=1 THEN
       {SPACE}X=X+4
DQ 330 IFP=2THENX=X+22
HA 340 Y=4:NEXT:PRINT#4,CHR$(1
       0)
AH 350 CLOSE3:CLOSE4:CLOSE6:OP
       EN10,4,10:PRINT#10:CLOS
       E10:GOTO70
FP 360 REM * SAVE ROUTINE *
XM 370 GOSUB680:PRINTCP$:INPUT
       "SAVE FILE NAME";NF$
PM 380 IFNF$=""THEN70
XF 390 OPEN3,3:OPEN8,8,8,"0:"+
       NF$+",S,W"
JS 400 IFP=1THENX=1026:FORI=0T
       07:FORJ=3TO38
QR 410 IFP=2THENX=1035:FORI=0T
       07:FORJ=12TO29
QG 420 Y=PEEK(X):PRINT#8,Y:X=X
       +1:NEXT:IFP=1THENX=X+4
KH 430 IFP=2THENX=X+22
HJ 440 NEXT:CLOSE3:CLOSE8:GOTO
       70
DH 450 REM * LOAD ROUTINE *
EE 460 GOSUB680:PRINTCP$:INPUT
       "LOAD FILE NAME";NF$
CQ 470 IFNF$=""THEN70
FX 480 OPEN3,3:OPEN8,8,8,"0:"+
       NF$+",S,R"
QF 490 IFP=1THENX=1026:FORI=0T
       07:FORJ=3TO38
HP 500 IFP=2THENX=1035:FORI=0T
       07:FORJ=12TO29
RE 510 INPUT#8,Y$:Y=VAL(Y$):PO
       KEX,Y:X=X+1:NEXT:IFP=1T
       HENX=X+4
AJ 520 IFP=2THENX=X+22
RC 530 NEXT:CLOSE3:CLOSE8:GOTO
       70
KG 540 REM * DESIGN A LABEL *
MH 550 GOSUB680:PRINTCP$"
       {4 DOWN}CENTER YOUR LAB
       EL IN THE BLOCK ABOVE."
QH 560 PRINT"{DOWN}REMEMBER TO
        LEAVE SPACES BETWEEN L
       INES."
SP 570 PRINT"{DOWN}PRESS {RVS}
       RETURN{OFF} WHEN DONE.
       {HOME}"
XD 580 IFM=3GOTO600
HG 590 GOSUB630
GM 600 IFP=1THENINPUT"{HOME}";
       L$:GOTO70
JK 610 IFP=2THENINPUT"{HOME}
       {9 RIGHT}";L$:GOTO70
QA 620 REM * SUBROUTINE FOR TO
       P LINES *
CG 630 IFP=1THENX$="{RVS}{RED}
       {2 SPACES}{OFF}{BLK}
       {36 SPACES}{RVS}{RED}
       {2 SPACES}{OFF}{BLK}"
CQ 640 IFP=2THENX$="{RVS}{RED}
       {11 SPACES}{OFF}{BLK}
       {18 SPACES}{RVS}{RED}
       {11 SPACES}{OFF}{BLK}"
EQ 650 PRINT"{HOME}";:FORI=0TO
       7:PRINTX$;:NEXT:PRINT"
       {HOME}"
AB 660 RETURN
SK 670 REM * SUBROUTINE FOR BO
       TTOM LINES *
EC 680 CP$="{HOME}{13 DOWN}":X
       $="{40 SPACES}"
XM 690 PRINTCP$;:FORI=13TO23:P
       RINTX$;:NEXT
BQ 700 PRINT"{39 SPACES}{HOME}
       ":RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Disk Editor

See instructions in article on page 90 before typing in.

```
2EE0:20 EC 2E 20 7B 32 20 54 89
2EE8:2F 4C 32 30 A2 00 A0 04 93
2EF0:AD 32 03 C9 ED F0 31 A2 E5
2EF8:00 A0 0C A9 00 85 05 A9 63
2F00:08 85 06 A9 88 8D 53 03 43
2F08:A9 90 8D 54 03 A9 43 8D 29
2F10:83 34 A9 05 8D 84 34 A9 53
2F18:5F 8D 76 34 A9 A4 8D 77 0E
2F20:34 A9 06 8D 3B 05 D0 22 4E
2F28:A9 00 85 05 A9 D8 85 06 1E
2F30:A9 06 8D 21 D0 8D 86 02 74
2F38:A9 0F 8D 20 D0 8D 21 D0 B2
2F40:A9 1E 8D 53 03 A9 AB 8D 85
2F48:54 03 86 03 84 04 A9 4C 66
2F50:8D 52 03 60 A9 93 20 D2 1F
2F58:FF A5 05 85 F7 A5 06 85 01
2F60:F8 A0 00 A2 03 A9 06 91 E9
2F68:F7 88 D0 FB E6 F8 CA 10 7F
2F70:F6 A9 69 A0 35 20 80 33 4A
2F78:A9 8F A0 35 20 80 33 A9 0A
2F80:DF A0 35 20 80 33 4C 89 92
2F88:2F A5 03 18 69 CB 85 F7 47
2F90:85 49 A5 04 69 00 85 F8 48
2F98:85 4A A2 00 A0 00 A9 10 09
2FA0:85 62 A9 04 85 63 A9 04 E0
2FA8:85 64 BD 49 36 20 CF 2F 30
2FB0:E8 F0 16 C6 64 D0 F3 A9 E6
2FB8:01 20 05 30 C6 63 D0 E6 8F
2FC0:A9 04 20 05 30 C6 62 D0 7B
2FC8:D9 20 11 30 4C B9 30 AC 97
2FD0:40 03 C0 01 F0 10 A0 00 41
2FD8:91 F7 A9 01 20 05 30 A9 62
2FE0:20 91 F7 4C FF 2F A0 00 75
2FE8:48 4A 4A 4A 4A 20 F3 2F D5
2FF0:68 29 0F 18 69 30 C9 3A 0B
2FF8:90 03 38 E9 39 91 F7 A9 AF
3000:01 20 05 30 60 18 65 F7 B2
3008:85 F7 A5 F8 69 00 85 F8 BC
3010:60 A5 03 85 F7 A5 04 85 A6
3018:F8 A0 0B AD 67 03 20 E8 C9
3020:2F A0 15 AD 68 03 20 E8 36
3028:2F A0 1D AD 69 03 20 E8 47
3030:2F 60 AD 67 03 8D 5D 03 78
3038:AD 68 03 8D 5E 03 CE 48 A7
3040:03 D0 12 CE 49 03 D0 0D 8A
3048:A9 0A 8D 49 03 A0 00 B1 92
3050:3F 49 80 91 3F 20 E4 FF 10
3058:F0 D8 C9 91 D0 09 A6 42 F3
3060:F0 0F C6 42 4C B6 30 C9 61
3068:11 D0 0E A6 42 E0 0F D0 36
3070:03 4C 78 32 E6 42 4C B6 27
3078:30 C9 9D D0 1A A6 41 D0 E2
3080:0B A6 42 F0 12 AE 5C 03 6E
3088:86 41 D0 D2 A5 41 38 ED 54
3090:40 03 85 41 4C B6 30 C9 FD
3098:1D D0 5D A6 41 EC 5C 03 4B
30A0:D0 0C A6 42 E0 0F F0 50 DA
30A8:A2 00 86 41 F0 BD A5 41 4A
30B0:18 6D 40 03 85 41 20 B3 D5
30B8:33 A5 49 85 3F A5 4A 85 48
30C0:40 A6 42 F0 10 A5 3F 18 EF
30C8:69 28 85 3F A5 40 69 00 8D
30D0:85 40 CA D0 F0 A5 41 4A 55
30D8:4A 4A 18 65 41 18 65 3F BE
30E0:85 3F A5 40 69 00 85 40 23
30E8:A0 00 B1 3F 8D 3E 03 20 4F
30F0:A0 33 20 11 30 4C 32 30 CA
30F8:C9 12 D0 0A A9 00 85 62 38
3100:20 04 33 4C D2 31 C9 13 A0
3108:D0 09 A9 00 85 41 85 42 C8
3110:4C B6 30 C9 DB D0 26 EE 46
3118:68 03 AE 67 03 AC 68 03 5A
3120:A9 01 85 62 20 BB 33 90 55
3128:11 A9 00 A9 00 8D 68 03 22
3130:EE 67 03 AD 67 03 C9 24 1E
3138:F0 2B 4C FC 30 C9 DD D0 6C
3140:27 AD 68 03 D0 0A CE 67 92
3148:03 F0 1A A9 16 8D 68 03 01
3150:CE 68 03 A9 01 85 62 AE C0
3158:67 03 AC 68 03 20 BB 33 8E
3160:B0 DF 4C FC 30 4C 32 30 B3
3168:C9 0A D0 16 20 A0 33 AA 42
3170:BD 49 36 8D 67 03 BD 4A B0
3178:36 8D 68 03 20 04 33 4C 5A
3180:D2 31 C9 17 D0 06 20 CA EC
3188:32 4C D2 31 C9 18 D0 23 F7
3190:A9 02 20 C3 FF A2 01 20 35
3198:C9 FF A9 17 A0 36 20 52 F6
31A0:03 20 CC FF A9 01 20 C3 7B
31A8:FF A9 93 20 D2 FF A2 80 46
31B0:6C 00 03 C9 9F D0 03 4C D8
31B8:33 34 C9 01 D0 1F AD 40 A9
31C0:03 49 03 8D 40 03 46 41 0C
31C8:06 41 AD 5C 03 49 01 8D C6
31D0:5C 03 20 9B 34 B0 03 4C 96
31D8:89 2F 4C 78 32 C9 2B D0 BC
31E0:0D A2 00 A0 0B 20 DE 34 47
31E8:8D 67 03 4C D2 31 C9 2D 2D
31F0:D0 0D A2 00 A0 17 20 DE D3
31F8:34 8D 68 03 4C D2 31 AE D4
3200:40 03 E0 02 F0 08 C9 30 EC
3208:90 61 C9 3A B0 5D A0 00 26
3210:8D 3E 03 91 3F 48 20 A0 40
3218:33 A5 3F 85 62 A5 40 85 6F
3220:63 AD 40 03 C9 02 D0 07 D8
3228:68 9D 49 36 4C 9B 30 A5 8B
3230:41 4A 90 08 A5 62 D0 02 B4
3238:C6 63 C6 62 68 A9 00 85 47
3240:64 A8 B1 62 20 5B 32 06 36
3248:64 06 64 06 64 06 64 C8 1A
3250:B1 62 20 5B 32 8D 3D 03 25
3258:4C 29 32 18 69 09 C9 39 31
3260:90 03 38 E9 39 18 65 64 CC
3268:85 64 60 C9 41 90 09 C9 79
3270:47 B0 05 38 E9 40 D0 96 51
3278:4C 32 30 A9 00 85 41 85 4E
3280:42 A9 01 8D 40 03 A9 1F E9
3288:8D 5C 03 A9 02 A2 17 A0 2F
3290:36 20 BD FF A9 01 A2 08 6E
3298:A0 0F 20 BA FF 20 C0 FF C2
32A0:20 B1 32 A9 12 8D 67 03 FA
32A8:A9 00 8D 68 03 20 04 33 ED
32B0:60 A9 02 20 C3 FF A9 01 64
32B8:A2 16 A0 36 20 BD FF A9 0D
32C0:02 A2 08 A8 20 BA FF 4C 92
32C8:C0 FF A2 02 20 C9 FF A0 CA
32D0:01 B9 49 36 20 D2 FF C8 C5
32D8:D0 F7 AD 49 36 20 D2 FF C5
32E0:20 CC FF AE 67 03 AC 68 7C
32E8:03 A9 32 20 23 33 20 9B 43
32F0:34 A2 01 20 C9 FF A9 17 F2
32F8:A0 36 20 52 03 20 CC FF 96
3300:20 B1 32 60 AE 67 03 AC F4
3308:68 03 A9 31 20 23 33 A2 42
3310:02 20 C6 FF A0 00 20 CF 6D
3318:FF 99 49 36 C8 D0 F7 20 0B
3320:CC FF 60 8D 0A 36 20 38 73
3328:33 A2 01 20 C9 FF A9 09 9D
3330:A0 36 20 52 03 4C CC FF 80
3338:A9 00 85 62 20 BB 33 8A 2B
3340:48 98 20 66 33 A5 64 09 5D
3348:30 8D 13 36 A5 65 09 30 F4
```

```
3350:8D 14 36 68 20 66 33 A5 76
3358:64 09 30 8D 10 36 A5 65 1C
3360:09 30 8D 11 36 60 48 A9 87
3368:FF 85 64 85 65 68 E6 64 14
3370:38 E9 0A B0 F9 18 69 0A C6
3378:E6 65 38 E9 01 B0 F9 60 70
3380:85 FC 84 FD A0 00 B1 FC BE
3388:AA C8 B1 FC A8 18 20 F0 53
3390:FF A5 FC 18 69 02 48 A5 0B
3398:FD 69 00 A8 68 4C 52 03 FE
33A0:A5 41 4A 85 62 A5 42 0A 04
33A8:0A 0A 0A 18 65 62 AA 8D F0
33B0:69 03 60 A0 00 AD 3E 03 D8
33B8:91 3F 60 E0 00 F0 28 E0 C6
33C0:12 B0 06 C0 15 B0 20 90 65
33C8:1C E0 19 B0 06 C0 13 B0 AD
33D0:16 90 12 E0 1F B0 06 C0 3F
33D8:12 B0 0C 90 08 E0 24 B0 BB
33E0:06 C0 11 B0 02 18 60 A5 7E
33E8:62 D0 1F A9 1D A0 36 20 2B
33F0:80 33 20 23 34 20 0C 34 09
33F8:AD 5D 03 8D 67 03 AD 5E C7
3400:03 8D 68 03 68 68 68 68 A8
3408:68 68 38 60 A5 03 18 69 9E
3410:48 85 62 A5 04 69 03 85 F5
3418:63 A0 A0 A9 20 91 62 88 9D
3420:D0 FB 60 20 58 35 A9 39 22
3428:A0 36 20 80 33 20 E4 FF 5E
3430:F0 FB 60 A9 93 20 D2 FF 79
3438:A9 03 A2 08 A0 00 20 BA 0B
3440:FF A9 02 A2 1A A0 36 20 5D
3448:BD FF 20 C0 FF 20 9B 34 85
3450:B0 3B A2 03 20 C6 FF 20 A0
3458:CF FF 20 CF FF A9 0D 20 8A
3460:D2 FF 20 CF FF 85 62 20 2E
3468:CF FF 05 62 F0 1F 20 CF 93
3470:FF AA 20 CF FF 20 CD BD 5E
3478:A9 20 20 D2 FF 20 CF FF 0F
3480:F0 DB AE 8D 02 D0 FB 20 72
3488:D2 FF 4C 7D 34 20 CC FF 77
3490:A9 03 20 C3 FF 20 23 34 C9
3498:4C E6 2E A2 01 20 C6 FF E6
34A0:20 CF FF C9 32 90 20 48 06
34A8:A9 90 20 D2 FF A2 16 A0 92
34B0:08 18 20 F0 FF 68 20 D2 EA
34B8:FF 20 CF FF 48 20 D2 FF 8B
34C0:68 C9 0D D0 F4 F0 0C 20 22
34C8:CF FF C9 0D D0 F9 20 CC 9E
34D0:FF 18 60 20 CC FF 20 23 17
34D8:34 20 0C 34 38 60 18 20 BB
34E0:F0 FF A0 00 20 58 35 A9 4C
34E8:A4 20 D2 FF A9 9D 20 D2 DC
34F0:FF 84 64 20 E4 FF A4 64 DD
34F8:C9 0D F0 30 C9 14 D0 11 FB
3500:C0 00 F0 0D 88 20 4E 35 50
3508:20 53 35 20 53 35 4C E7 EF
3510:34 C9 30 90 DC C9 3A 90 29
3518:08 C9 41 90 D4 C9 47 B0 37
3520:D0 20 D2 FF 99 62 00 C8 74
3528:C0 02 D0 BB A5 62 20 44 84
3530:35 C0 01 F0 0E 0A 0A 0A 4B
3538:0A 85 62 A5 63 20 44 35 09
3540:18 65 62 60 38 E9 30 C9 F5
3548:0A 90 02 E9 07 60 A9 20 E7
3550:4C D2 FF A9 9D 4C D2 FF F3
3558:A2 06 AD 32 03 C9 ED F0 7A
3560:04 8E 3B 05 60 8E 86 02 74
3568:60 00 00 13 20 20 20 20 16
3570:20 1C 12 54 52 41 43 4B E2
3578:1D 1D 1D 1D 1D 1D 53 45 77
3580:43 54 4F 52 1D 1D 1D 1D 65
3588:1D 1D 42 59 54 45 00 05 63
3590:00 90 30 30 11 9D 9D 31 93
3598:30 11 9D 9D 32 30 11 9D FE
35A0:9D 33 30 11 9D 9D 34 30 B9
35A8:11 9D 9D 35 30 11 9D 9D A8
35B0:36 30 11 9D 9D 37 30 11 79
35B8:9D 9D 38 30 11 9D 9D 39 D6
35C0:30 11 9D 9D 41 30 11 9D 9F
35C8:9D 42 30 11 9D 9D 43 30 C3
35D0:11 9D 9D 44 30 11 9D 9D C1
35D8:45 30 11 9D 9D 46 30 04 58
35E0:00 20 20 20 30 20 31 20 DD
35E8:32 20 33 20 20 34 20 35 24
35F0:20 36 20 37 20 20 38 20 82
35F8:39 20 41 20 42 20 20 43 48
3600:20 44 20 45 20 46 20 92 D2
3608:00 55 31 20 32 20 30 20 84
3610:30 30 20 30 30 00 23 49 B8
3618:30 00 24 30 00 16 0A 1C AC
3620:92 49 4C 4C 45 47 41 4C 8C
3628:20 54 52 41 43 4B 20 4F EE
3630:52 20 53 45 43 54 4F 52 E8
3638:00 18 0F 12 48 49 54 20 DD
3640:41 4E 59 20 4B 45 59 92 C2
3648:00 00 00 00 00 00 00 00 B4
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Kicker

See instructions in article on page 42 before typing in.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 A9 00 8D 20 3A
0811:D0 8D 21 D0 A9 43 A0 0D C6
0819:20 1E AB A9 FB A0 0D 20 6D
0821:1E AB A5 C5 C9 0D F0 0E AE
0829:C9 24 F0 07 C9 15 D0 F2 EC
0831:A9 7F 2C A9 3F 2C A9 1F 33
0839:85 A9 A9 93 20 D2 FF A9 DA
0841:B0 85 A5 85 A6 A0 00 98 68
0849:A2 A0 A9 00 99 00 D8 99 20
0851:FA D8 99 F4 D9 99 EE DA 85
0859:A9 A0 99 00 04 99 FA 04 1A
0861:99 F4 05 99 EE 06 88 D0 27
0869:E1 A9 0F 8D 21 D0 20 0F 2B
0871:0C A9 8A A0 0C 20 1E AB 16
0879:20 0F 0C A9 A6 A0 0C 20 69
0881:1E AB A9 14 85 02 20 0F 85
0889:0C A9 C5 A0 0C 20 1E AB 95
0891:C6 02 D0 F2 20 0F 0C A9 CD
0899:A6 A0 0C 20 1E AB A2 CE 5C
08A1:8E 7A 07 CA 8E 8E 07 20 02
08A9:0F 0C A9 8A A0 0C 20 1E B5
08B1:AB A0 05 84 02 A9 03 99 FE
08B9:29 0E BE 84 0C A0 0F 18 1B
08C1:20 F0 FF A9 E4 A0 0C 20 9A
08C9:1E AB C6 02 A4 02 10 E5 FF
08D1:A9 10 A0 0D 20 1E AB A2 13
08D9:00 A0 20 18 20 F0 FF A9 06
08E1:0F A0 0D 20 1E AB A9 B1 E9
08E9:8D 08 04 A2 18 A9 00 9D 72
08F1:00 D4 CA 10 FA A9 50 8D 3E
08F9:01 D4 8D 08 D4 A9 01 8D CE
0901:05 D4 A9 0F 8D 18 D4 A9 11
0909:09 8D 0C D4 AD 1E D0 A0 F9
0911:00 98 8D 26 D0 99 40 03 CD
0919:C8 10 FA A0 13 B9 36 0C F4
0921:99 40 03 88 10 F7 A2 0D AB
0929:8E FF 07 E8 8E FC 07 8E F6
0931:FD 07 8E FE 07 E8 8E F9 B8
0939:07 8E FA 07 8E FB 07 A9 5E
0941:0F 8D 25 D0 A2 02 8E 28 52
0949:D0 8E 29 D0 8E 2A D0 A9 02
0951:06 8D 2B D0 8D 2C D0 8D 88
0959:2D D0 A9 FE 8D 1C D0 A9 83
0961:7E 8D 17 D0 A9 07 8D 2E B8
0969:D0 A0 19 B9 4A 0C 99 83 04
0971:03 B9 64 0C 99 C0 03 88 1F
0979:10 F1 A9 80 8D 15 D0 A9 59
0981:8F 85 FC A9 B7 85 04 A9 7C
0989:00 85 9B 85 02 A5 FB 18 7F
0991:65 02 85 FB B0 03 4C 62 D3
0999:0A A4 FC A5 FD F0 6D C0 23
09A1:DE F0 07 E6 FC F0 03 4C AC
09A9:62 0A 20 22 0C A5 04 C9 5E
09B1:AD 90 4C C9 C2 B0 48 E6 35
09B9:A5 A5 A5 8D 2D 04 A9 00 62
09C1:8D 15 D0 A9 08 85 9D A9 CF
09C9:06 8D AC DB 20 2C 0C 20 7F
09D1:17 0C A9 0C 8D AC DB 20 5F
09D9:2C 0C 20 17 0C C6 9D D0 02
09E1:E6 A5 A5 C9 B9 D0 93 A2 FC
09E9:0B A0 0F 18 20 F0 FF A9 7B
09F1:1F A0 0D 20 1E AB A5 C5 10
09F9:C9 40 F0 FA 4C 0D 08 A5 1B
0A01:FD 49 01 85 FD A5 02 4A B3
0A09:09 01 85 02 C0 40 F0 04 9F
0A11:C6 FC D0 4D 20 22 0C A5 FD
0A19:04 C9 AD 90 32 C9 C2 B0 4F
0A21:2E E6 A6 A5 A6 8D 4C 04 3D
0A29:A9 00 8D 15 D0 A9 08 85 D7
0A31:9D A9 02 8D 14 D8 20 2C 08
0A39:0C 20 17 0C A9 0C 8D 14 AB
0A41:D8 20 2C 0C 20 17 0C C6 4C
0A49:9D D0 E6 A5 A6 D0 94 A5 DE
0A51:FD 49 01 85 FD A5 02 4A 04
0A59:09 01 85 02 30 03 4C A4 CD
0A61:09 A5 03 18 65 9B 85 03 EC
0A69:90 38 A4 04 A5 05 F0 18 E3
0A71:C0 FF F0 04 E6 04 D0 2A 57
0A79:20 22 0C A5 05 49 01 85 D6
0A81:05 A5 9B 4A 09 01 85 9B 8C
0A89:C0 6E F0 04 C6 04 D0 12 F1
0A91:20 22 0C A5 05 49 01 85 EE
0A99:05 A5 9B 4A 09 01 85 9B A4
0AA1:10 D2 AD 1E D0 F0 29 A2 49
0AA9:00 A4 A8 C9 8F 90 03 E8 46
0AB1:A4 A7 C0 00 F0 1A A5 A9 FE
0AB9:85 02 AD 04 DC 25 A9 85 5B
0AC1:9B 86 FD AD 04 DC 29 01 C6
0AC9:85 05 20 22 0C 4C FD 0A 9F
0AD1:A5 FC 8D 0F D0 A5 04 8D 4D
0AD9:0E D0 A5 02 C9 02 90 0B 80
0AE1:A5 FE 38 E9 01 85 FE B0 FA
0AE9:02 C6 02 A5 9B C9 02 90 E3
0AF1:0B A5 06 38 E9 01 85 06 9D
0AF9:B0 02 C6 9B C6 9C F0 03 07
0B01:4C BB 0B A9 14 85 9C AD C5
0B09:00 DC A8 29 10 F0 0B A9 02
0B11:04 85 A8 AD 15 D0 29 F1 AA
0B19:D0 0B A5 A8 F0 02 C6 A8 5F
0B21:AD 15 D0 09 0E 20 C3 0B 81
0B29:E8 BD 7E 0C 8D 03 D0 8D 5B
0B31:05 D0 8D 07 D0 A5 9D 20 98
0B39:EB 0B 8D 02 D0 69 28 8D E3
0B41:04 D0 69 28 8D 06 D0 BD 21
0B49:84 0C AA E4 9E D0 04 C4 4D
0B51:9F F0 0F 86 9E 84 9F 18 1C
0B59:20 F0 FF A9 FF A0 0C 20 11
0B61:1E AB AD 01 DC A8 29 10 23
0B69:F0 0B A9 04 85 A7 AD 15 6B
0B71:D0 29 8F D0 0B A5 A7 F0 68
0B79:02 C6 A7 AD 15 D0 09 70 80
0B81:20 C3 0B BD 7E 0C 8D 09 1E
0B89:D0 8D 0B D0 8D 0D D0 20 3C
0B91:EB 0B 8D 08 D0 69 28 8D 9C
0B99:0A D0 69 28 8D 0C D0 BD 94
0BA1:84 0C AA E4 A3 D0 04 C4 CD
0BA9:A4 F0 0F 86 A3 84 A4 18 29
0BB1:20 F0 FF A9 FF A0 0C 20 69
0BB9:1E AB A2 00 CA D0 FD 4C FF
0BC1:8E 09 8D 15 D0 98 29 01 A0
0BC9:F0 08 98 29 02 F0 06 A2 82
0BD1:02 2C A2 00 2C A2 04 98 D4
0BD9:29 04 F0 08 98 29 08 F0 8E
0BE1:06 A0 01 2C A0 00 2C A0 04
0BE9:02 60 98 18 7D 29 0E 38 92
0BF1:E9 01 30 05 C9 07 F0 04 E3
0BF9:2C A9 00 2C A9 06 9D 29 1D
0C01:0E 48 18 69 0B A8 68 0A A1
0C09:0A 0A 18 69 75 60 A9 F5 B8
0C11:A0 0C 20 1E AB 60 A2 80 07
0C19:A0 00 88 D0 FD CA D0 FA 57
```

```
0C21:60 A2 80 8E 04 D4 E8 8E DE
0C29:04 D4 60 A2 10 8E 0B D4 54
0C31:E8 8E 0B D4 60 2A 00 00 BB
0C39:9A 80 00 9A B0 00 AA B0 F3
0C41:00 AA B0 00 2A F0 00 0F 3E
0C49:C0 05 40 00 05 40 00 AA DE
0C51:A8 00 AA A8 00 0A 80 00 C6
0C59:0F C0 00 0F C0 00 05 40 6A
0C61:00 05 40 05 40 00 05 40 5F
0C69:00 0F C0 00 0F C0 00 0A E2
0C71:80 00 AA A8 00 AA A8 00 A5
0C79:05 40 00 05 40 4C 64 7C EC
0C81:94 AC C4 04 07 0A 0D 10 72
0C89:13 12 98 20 20 20 20 20 A6
0C91:20 20 20 20 20 20 20 20 A9
0C99:20 20 20 20 20 20 20 20 B1
0CA1:20 20 8E 0D 00 12 98 20 0E
0CA9:97 CD 20 20 20 20 20 20 E8
0CB1:20 20 90 20 20 20 97 20 C6
0CB9:20 20 20 20 20 20 20 CE 80
0CC1:98 20 0D 00 12 98 20 97 9A
0CC9:20 1E 20 20 20 20 20 20 61
0CD1:20 20 20 20 20 20 20 20 E9
0CD9:20 20 20 20 20 97 20 98 48
0CE1:20 0D 00 12 1E D1 1D 1D FD
0CE9:1D 1D D1 1D 1D 1D 1D D1 4D
0CF1:13 1D 1F 00 1D 1D 1D 1D 73
0CF9:1D 1D 1D 1D 1D 00 12 1E 88
0D01:20 D1 20 1D 1D 20 D1 20 A2
0D09:1D 1D 20 D1 20 00 1C 50 A3
0D11:4C 41 59 45 52 20 32 11 A9
0D19:9D 9D 9D 9D 30 00 97 20 C7
0D21:47 41 4D 45 20 4F 56 45 5D
0D29:52 20 11 9D 9D 9D 9D 9D AC
0D31:9D 9D 9D 9D 9D 9D 20 48 FA
0D39:49 54 20 41 20 4B 45 59 37
0D41:20 00 93 11 11 11 11 11 EE
0D49:1D 1D 1D 1D 1D 1D 1D 1C 62
0D51:12 A1 92 A1 12 BE 92 BE B8
0D59:20 12 BB AC 92 20 AC 12 CA
0D61:AC BB 92 BB 12 A1 92 A1 AC
0D69:12 BE 92 BE 12 A1 AC A2 8D
0D71:92 BE 12 A1 AC BB 92 BB 16
0D79:0D 20 20 20 20 20 20 20 0A
0D81:05 12 A1 20 92 BE 20 20 C8
0D89:12 A1 92 A1 20 12 A1 92 A0
0D91:A1 20 20 12 A1 20 92 BE 1B
0D99:20 12 A1 BC 92 BB 20 12 1E
0DA1:A1 BC BE 92 BE 0D 20 20 47
0DA9:20 20 20 20 20 9A 12 A1 13
0DB1:AC BC 92 20 20 12 A1 92 C4
0DB9:A1 20 12 A1 92 A1 AC BB 39
0DC1:12 A1 AC BC 92 20 12 A1 89
0DC9:92 A1 20 20 12 A1 AC BC C8
0DD1:0D 20 20 20 20 20 20 20 62
0DD9:BC BE BC BE 20 12 A2 A2 B6
0DE1:92 20 20 12 A2 A2 92 20 57
0DE9:BC BE BC BE BC 12 A2 A2 AB
0DF1:92 BE BC BE BC BE 0E 08 8D
0DF9:0D 00 11 11 11 9E 20 20 31
0E01:20 20 C5 4E 54 45 52 20 4F
0E09:53 50 45 45 44 3A 20 12 3D
0E11:53 92 4C 4F 57 2C 20 12 B7
0E19:4D 92 45 44 49 55 4D 2C D3
0E21:20 12 46 92 41 53 54 00 C3
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Lexitron

Article on page 44.

```
HB 100 PRINT"{CLR}{3 DOWN}"SPC
       (11)"L E X I T R O N
       {3 DOWN}":DIMAR$(20,15)
       ,AR(20,15),LN(200)
FQ 110 P$="{HOME}{23 DOWN}
       {15 SPACES}":FORA=0TO10
       :READQ(A):NEXT
CB 120 FORA=0TO8:READD(A):NEXT
       :DATA 0,1,5,0,7,8,6,0,3
       ,2,4,0,-40,-39,1,41,40,
       39,-1
JA 130 DIML(200):DATA -41:PRIN
       TSPC(3)"PLEASE WAIT WHI
       LE LOADING WORDS"
MD 140 S=54272:FORA=STOS+23:PO
       KEA,0:NEXT:POKEA,15:POK
       ES+5,28:POKE53280,6
KG 150 SC=1274:CD=54272:PT=563
       20:BC=53281:W=15:BL=6:S
       B=53265:CS=15
PB 160 Z=646:A1=15:A2=14:A3=1:
       A4=7:A5=6:A6=1
EK 170 GOSUB1160:GOSUB1120
SD 180 GOSUB1090
KE 190 GW=0:FORA=0TO19:FORB=0T
       O14:AR(A,B)=0:NEXTB,A:F
       ORA=0TONW:L(A)=0:NEXT:P
       S=SC
ME 200 LL=7:POKEBC,W:POKEZ,A5:
       PRINT"{CLR}{3 DOWN}
       {5 SPACES}USE JOYSTICK
       {SPACE}TO CHOOSE A LEVE
       L"
CS 210 POKEZ,A6:PRINTSPC(10)"
       {2 DOWN}{5 SPACES}{RVS}
       1";:POKEZ,A5:PRINT"
       {2 SPACES}2{2 SPACES}3"
       :MS=SC+5
HQ 220 PRINT"{4 DOWN}
       {3 SPACES}{RVS}1{OFF}
       {2 SPACES}ALL WORDS SPE
       LLED FORWARDS
       {14 SPACES}NO DIAGONALS
       "
SM 230 PRINT"{3 SPACES}
       {2 DOWN}{RVS}2{OFF}
       {2 SPACES}FORWARD & REV
       ERSED SPELLINGS
       {12 SPACES}NO DIAGONALS
       "
CM 240 PRINT"{3 SPACES}
       {2 DOWN}{RVS}3{OFF}
       {2 SPACES}FORWARD & REV
       ERSED SPELLINGS
       {12 SPACES}DIAGONALS IN
       CLUDED"
PG 250 GOSUB410:IFJ=0THEN250
RS 260 POKEMS+CD,A5:MS=MS-3*(J
       =3)*-(MS<SC+11)+3*(J=7)
       *-(MS>SC+5):POKEMS+CD,A
       6
QS 270 IFJ<128THEN250
QJ 280 PRINT"{CLR}{BLK}
       {8 DOWN}"SPC(14)"PLEASE
        WAIT":FORTD=1TO1000:NE
       XT
RM 290 LV=(MS-(SC+5))/3+1:POKE
       SB,PEEK(SB)AND239:POKEB
       C,BL:GOSUB970
XK 300 GOSUB850:QF=1:T=1:GOSUB
       480:POKESB,PEEK(SB)OR16
       :TI$="000000":GOTO390
BS 310 REM JOYSTICK ROUTINE
EP 320 IFRND(1)<.003THENGOSUB6
       70
FP 330 IFRND(1)<.009THENGOSUB5
       40
BA 340 GOSUB410:IFJ=0THEN320
AM 350 IFJ>127THENGOSUB430:GOT
       O320
RR 360 POKEPS,PEEK(PS)AND127:T
       P=PS
QE 370 IF(PEEK(PS+CD)ANDCS)=A3
       THENPOKEPS+CD,A2
CP 380 PS=PS+D(JAND15):IFPEEK(
       PS)<10RPEEK(PS)>26THENP
       S=TP
MG 390 POKEPS,PEEK(PS)OR128:IF
       (PEEK(PS+CD)ANDCS)<>A4T
       HENPOKEPS+CD,A3
JP 400 GOTO320
EC 410 J=Q(15-(PEEK(PT)AND15))
       -128*((PEEK(PT)AND16)=0
       ):RETURN
BH 420 REM PRESS FIREBUTTON
EH 430 IF(PEEK(PS+CD)ANDCS)=A4
       THENRETURN
QX 440 Y=INT((PS-SC)/40):X=PS-
       SC-Y*40
KJ 450 IFAR(X,Y)=0THENPRINTP$"
       TRY ANOTHER":GOSUB540:R
       ETURN
QG 460 PRINTP$"GOOD ANSWER"
BP 470 POKEPS+CD,A4:T=AR(X,Y)-
       1:L(T)=L(T)+1
GD 480 POKES+4,16:POKES+4,17:P
       OKES+1,10+10*L(T)
FP 490 FORA=SC+554TO(SC+554)-4
       0*LLSTEP-40:POKEA+40,93
       :POKEA+71,93
KM 500 POKEA,160:POKEA+31,160:
       FORTD=1TO20:NEXT:NEXT:I
       FQF=1THENQF=0:RETURN
GF 510 GOSUB590:LL=LL-(LL<15):
       AR(X,Y)=0:IFL(T)=LN(T)T
       HENGOSUB610
EG 520 RETURN
JH 530 REM ENERGY DRAIN
CJ 540 POKES+4,32:POKES+4,33:P
       OKES+1,30:FORTD=1TO200:
       NEXT:POKES+1,15
SD 550 FORA=SC-6TO(SC-6)+40*(1
       5-LL)STEP40:POKEA-40,93
       :POKEA-9,93:POKEA,160
AP 560 POKEA+31,160:FORTD=1TO2
       0:NEXT:NEXT:GOSUB590:LL
       =LL-1:IFLL=-1THEN700
JM 570 RETURN
RJ 580 REM CLEAR MESSAGE
XQ 590 PRINTP$"{19 SPACES}":RE
       TURN
GA 600 REM GOT A WORD
AK 610 GW=GW+1:IFGW=10THEN770
JK 620 FORTD=1TO300:NEXT:PRINT
       P$"WELL DONE!"
AB 630 POKES+4,32
SD 640 POKES+4,35:FORA=6TO20:P
       OKES+1,A:FORTD=30TO40:P
       OKES+15,TD:NEXT:NEXT
RK 650 GOSUB590:RETURN
GJ 660 REM GIVE A CLUE
SX 670 A=RND(1)*10:IFL(A)=0THE
       NPRINTP$"CLUE:"W$(A+M):
       FORT=1TO800:NEXT
BS 680 GOSUB590:RETURN
SC 690 REM END OF GAME
KQ 700 PRINT"{HOME}{4 DOWN}
       {BLK}":FORA=0TO14:PRINT
       :PRINTSPC(10);:FORB=0TO
       19
RB 710 IFAR(B,A)<>0THENPRINTAR
       $(B,A);:GOTO730
JQ 720 PRINT"{RIGHT}";
HG 730 NEXT:NEXT:PRINT:POKEZ,A
       4:PRINT "{2 DOWN}
       {6 SPACES}PRESS FIREBUT
       TON TO CONTINUE"
RX 740 GOSUB410:IFJ<128THEN740
XJ 750 GOSUB410:IFJ>127THEN750
JS 760 POKEZ,A5:PRINT"{CLR}
       {4 DOWN}{6 SPACES}SORRY
       , YOU DIDN'T MAKE IT
       {4 DOWN}":GOTO790
GE 770 POKEZ,A5:PRINT"{CLR}
       {4 DOWN}{6 SPACES}CONGR
       ATULATIONS!{2 SPACES}YO
       U WON"
QD 780 PRINT"{3 DOWN}
       {9 SPACES}YOUR TIME WAS
        "MID$(TI$,3,2)":"RIGHT
       $(TI$,2)
XR 790 FORI=1TO1000:NEXT:POKEB
```

```
      C,W:PRINT"{5 DOWN}
      {4 SPACES}PRESS FIREBUT
      TON TO PLAY AGAIN"
PA 800 PRINT"{2 DOWN}
      {10 SPACES}PRESS DOWN T
      O QUIT"
RG 810 GOSUB410:IFJ>127THENPRI
      NTSPC(13)"{2 DOWN}{RVS}
      PLEASE WAIT":GOSUB1170:
      GOTO180
QE 820 IFJTHENPRINT"{CLR}":END
RK 830 GOTO810
MR 840 REM PRINT ARRAY
KG 850 PRINT"{CLR}{4 SPACES}
      {CYN}{RVS}{K}{OFF}{K}
      {2 SPACES}{RVS}{K}{D}
      {I}{OFF}{V}{RVS}{K}
      {OFF}{K}{RVS}{K}{OFF}
      {K} {RVS}{F}{D}{OFF}
      {C}{RVS}{F}{D}{OFF}{V}
      {RVS}{K}{D}{F}{OFF}{F}
      {D}{RVS}{D}{F}{OFF}{F}
      {RVS}{K}{C}{K}{OFF}{K}"
      SPC(8);
CP 860 PRINT"{RVS}{K}{OFF}{K}
      {2 SPACES}{RVS}{K}{C}
      {OFF}{F}{2 SPACES}{RVS}
      {F}{D}{OFF}{2 SPACES}
      {RVS}{K}{OFF}{K}
      {2 SPACES}{RVS}{K}{OFF}
      {K} {RVS}{K}{C}{V}{OFF}
      {V}{RVS}{K}{OFF}{K}
      {RVS}{K}{OFF}{K}{RVS}
      {K}{2 SPACES}{OFF}{K}"S
      PC(8)"{7}{RVS}{K}{OFF}
      {K}";
FG 870 PRINT"{2 SPACES}{RVS}
      {K}{OFF}{K}{2 SPACES}
      {D}{RVS}{D}{F}{OFF}{F}
      {SPACE}{RVS}{K}{OFF}{K}
      {2 SPACES}{RVS}{K}{OFF}
      {K} {RVS}{K}{D}{C}{OFF}
       {RVS}{K}{OFF}{K}{RVS}
      {K}{OFF}{K}{RVS}{K}
      {OFF}{K}{RVS}{F}{OFF}
      {K}"SPC(8)"{C}{RVS}
      {2 I}{OFF}{V}{C}";
AG 880 PRINT"{RVS}{2 I}{OFF}
      {V}{C}{V}{C}{V} {RVS}
      {2 I}{OFF}{2 SPACES}{C}
      {V} {C}{V}{C}{V} {RVS}
      {2 I}{OFF} {C}{V}{C}{V}
      {DOWN}"
MX 890 POKEZ,A1:PRINTSPC(4)"B
      {4 SPACES}{RVS}{A}**********
      **********{S}{OFF}
      {4 SPACES}B"
PJ 900 PRINTSPC(4)"B{4 SPACES}
      {RVS}B{OFF}";:FORA=0TO1
      4:FORB=0TO19
FH 910 POKEZ,A2:IFAR$(B,A)=" "
      THENPRINTCHR$(65+RND(1)
      *26);:GOTO930
PC 920 PRINTAR$(B,A);
KG 930 NEXT:POKEZ,A1:PRINT"
      {RVS}B{OFF}{4 SPACES}B"
      :PRINTSPC(4);"B
      {4 SPACES}{RVS}B{OFF}";
      :NEXT
HB 940 PRINT:PRINTSPC(4)"{UP}B
      {4 SPACES}{RVS}{Z}****
      **********{X}{OFF}
      {4 SPACES}B"
CD 950 RETURN
KK 960 REM PUT WORDS IN THE AR
      RAY
MB 970 B=INT(RND(1)*(NW-10))
GH 980 M=B:FORA=0TO9:W$=W$(B+A
      )
HR 990 DR=RND(1)*2↑LV:DY=DY(DR
      ):DX=DX(DR):L=LEN(W$)
FF 1000 SX=INT(RND(1)*19+1):SY
      =INT(RND(1)*14+1):RX=S
      X:RY=SY
GD 1010 NX=SX+(L-1)*DX:NY=SY+(
      L-1)*DY:IFNX<0ORNY<0OR
      NX>19ORNY>14THEN990
KB 1020 FL=0:FORL=1TOLEN(W$):I
      FAR$(SX,SY)<>" "THENFL
      =1:L=LEN(W$)
XJ 1030 SX=SX+DX:SY=SY+DY
SQ 1040 NEXT:IFFLTHENA=A-1:NEX
      T
MX 1050 FORL=1TOLEN(W$):AR$(RX
      ,RY)=MID$(W$,L,1)
JD 1060 AR(RX,RY)=A+1:RX=RX+DX
      :RY=RY+DY:NEXT:LN(A)=L
      EN(W$):NEXT
MC 1070 RETURN
CH 1080 REM SHUFFLE WORDS
HE 1090 FORA=1TONW/2:B=RND(1)*
      NW:C=RND(1)*NW:T$=W$(B
      ):W$(B)=W$(C):W$(C)=T$
JX 1100 NEXT:RETURN
HH 1110 REM READ IN WORDS
DM 1120 DIMW$(200):NW=-1
MA 1130 NW=NW+1:READW$:FORA=1T
      OLEN(W$):W$(NW)=W$(NW)
      +CHR$(ASC(MID$(W$,A,1)
      )-1)
FP 1140 NEXT:IFW$(NW)<>"END"TH
      EN1130
SK 1150 RETURN
BJ 1160 FORA=0TO7:READDX(A),DY
      (A):NEXT
BF 1170 FORA=0TO19:FORB=0TO14:
      AR$(A,B)=" ":NEXTB,A
FM 1180 RETURN
AX 1190 DATA 0,1,1,0,0,-1,-1,0
      ,-1,1,1,1,1,-1,-1,-1
CX 1200 DATA DBSOJWBM,DJSDVT,D
      BOBEB,VOJUFE,UFMFQIPOF
      ,NPOLFZ,DPNQVUFS
RB 1210 DATA KPZTUJDL,NPOTUFS,
      TUBQMFS,NBHJDBM,TIVGGM
      F,FOE
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

The New Automatic Proofreader

Article on page 108.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN WAIT CLR:
   PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:WAIT CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
    CHECK FINAL LINE":END
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA
   +29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:
   NEW
160 DATA 120.169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,13
   6,137
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Power BASIC: Blink Mode

Article on page 93.

Program 1: Power BASIC: Blink Mode—64 Version

```
XA 100 FORI=49152TO49506:READA
       :POKEI,A:X=X+A:NEXT
XG 110 IFX<>36438THENPRINT"ERR
       OR IN DATA.":STOP
CG 120 PN$="BLINKOBJ":FORJ=1TO
       LEN(PN$):POKE704+J,ASC(
       MID$(PN$,J,1)):NEXTJ
SP 130 PRINT"{DOWN}{RVS}D{OFF}
       ISK OR {RVS}T{OFF}APE?
```

```
        {SPACE}";:DEVICE=8
JP 140  GETA$:IFA$="T"THENDEVIC
        E=1:GOTO160
XG 150  IFA$<>"D"THEN140
QG 160  PRINTA$:POKE780,15:POKE
        781,DEVICE:POKE782,255:
        SYS65466
PE 170  POKE780,LEN(PN$):POKE78
        1,193:POKE782,2:SYS6546
        9
XP 180  BA=49152:HI=INT(BA/256)
        :LO=BA-(HI*256):POKE251
        ,LO:POKE252,HI
QQ 190  EA=49507:HI=INT(EA/256)
        :LO=EA-(HI*256)+1:POKE7
        80,251:POKE781,LO:POKE7
        82,HI
MK 200  PRINT"{DOWN}SAVING ML V
        ERSION OF ";PN$:SYS6549
        6
CS 210  DATA 32,170,177,120,42,
        42,176,21,42,176,32
QD 220  DATA 42,176,42,42,176,8
        7,42,176,54,42,176
MA 230  DATA 101,42,176,108,168
        ,144,121,74,74,141
GM 240  DATA 94,193,140,93,193,
        238,97,193,56,176
QJ 250  DATA 105,169,234,141,21
        ,3,169,49,141,20,3
KF 260  DATA 56,176,92,169,192,
        141,21,3,169,156,141
RX 270  DATA 20,3,169,26,141,90
        ,193,56,176,74,152
SP 280  DATA 41,15,170,152,41,2
        40,74,74,74,74,157
MF 290  DATA 42,193,157,74,193,
        170,152,41,15,157,26
DF 300  DATA 193,157,58,193,56,
        176,44,152,41,15,170
MK 310  DATA 168,189,42,193,170
        ,152,153,74,193,138
GJ 320  DATA 157,58,193,56,176,
        22,152,41,15,170,188
PS 330  DATA 42,193,56,176,16,1
        60,15,152,153,74,193
GF 340  DATA 153,58,193,136,16,
        246,230,254,160,1
QJ 350  DATA 169,0,88,108,5,0,1
        73,97,193,208,10,206
JG 360  DATA 95,193,208,113,206
        ,96,193,16,108,48,3
FM 370  DATA 206,97,193,173,94,
        193,141,96,193,173
PS 380  DATA 93,193,141,95,193,
        169,0,133,251,169
KR 390  DATA 219,133,252,169,26
        ,77,90,193,141,90
HX 400  DATA 193,208,2,169,42,1
        41,250,192,141,10
KP 410  DATA 193,173,90,193,208
        ,23,165,254,240,19
JQ 420  DATA 198,254,160,15,185
        ,58,193,153,26,193
CK 430  DATA 185,74,193,153,42,
        193,136,16,241,160,0
FR 440  DATA 177,251,41,15,170,
        189,26,193,145,251
RE 450  DATA 169,4,133,253,160,
        232,177,251,41,15,170
BG 460  DATA 189,26,193,145,251
        ,136,208,243,198,252
MM 470  DATA 198,253,208,237,76
        ,49,234,0,1,2,3,4,5,6
AS 480  DATA 7,8,9,10,11,12,13,
        14,15,0,1,2,3,4,5,6,7
JB 490  DATA 8,9,10,11,12,13,14
        ,15,0,1,2,3,4,5,6,7,8
CE 500  DATA 9,10,11,12,13,14,1
        5,0,1,2,3,4,5,6,7,8,9
FM 510  DATA 10,11,12,13,14,15,
        0,0,1,0,0,0,0,0,0
```

Program 2: Power BASIC: Blink Mode—VIC Version

```
FP 100  PRINT"{CLR}PLEASE WAIT"
        :FORI=7168TO7490:READA:
        POKEI,A:X=X+A:NEXT
GG 110  IFX<>30062THENPRINT"
        {BLK}ERROR IN DATA STAT
        EMENTS":STOP
CG 120  PN$="BLINKOBJ":FORJ=1TO
        LEN(PN$):POKE704+J,ASC(
        MID$(PN$,J,1)):NEXTJ
SP 130  PRINT"{DOWN}{RVS}D{OFF}
        ISK OR {RVS}T{OFF}APE?
        {SPACE}";:DEVICE=8
JP 140  GETA$:IFA$="T"THENDEVIC
        E=1:GOTO160
XG 150  IFA$<>"D"THEN140
QG 160  PRINTA$:POKE780,15:POKE
        781,DEVICE:POKE782,255:
        SYS65466
PE 170  POKE780,LEN(PN$):POKE78
        1,193:POKE782,2:SYS6546
        9
FA 180  BA=7168:HI=INT(BA/256):
        LO=BA-(HI*256):POKE251,
        LO:POKE252,HI
CE 190  EA=7491:HI=INT(EA/256):
        LO=EA-(HI*256)+1:POKE78
        0,251:POKE781,LO:POKE78
        2,HI
FX 200  PRINT"{DOWN}SAVING ML V
        ERSION OF{2 SPACES}";PN
        $:SYS65496
XQ 210  DATA 32,170,209,120,42,
        42,176,21,42
SA 220  DATA 176,32,42,176,42,4
        2,176,87,42
FB 230  DATA 176,54,42,176,101,
        42,176,108,168
SP 240  DATA 144,121,74,74,141,
        62,29,140,61
XK 250  DATA 29,238,65,29,56,17
        6,105,169,234
RQ 260  DATA 141,21,3,169,191,1
        41,20,3,56
KF 270  DATA 176,92,169,28,141,
        21,3,169,156
GQ 280  DATA 141,20,3,169,26,14
        1,58,29,56
FG 290  DATA 176,74,152,41,15,1
        70,152,41,240
DH 300  DATA 74,74,74,74,157,34
        ,29,157,50
KG 310  DATA 29,170,152,41,15,1
        57,26,29,157
PB 320  DATA 42,29,56,176,44,15
        2,41,15,170
PK 330  DATA 168,189,34,29,170,
        152,153,50,29
KQ 340  DATA 138,157,42,29,56,1
        76,22,152,41
PM 350  DATA 15,170,188,34,29,5
        6,176,16,160
KQ 360  DATA 7,152,153,50,29,15
        3,42,29,136
DR 370  DATA 16,246,230,254,160
        ,1,169,0,88
FX 380  DATA 108,5,0,173,65,29,
        208,10,206
BB 390  DATA 63,29,208,113,206,
        64,29,16,108
JQ 400  DATA 48,3,206,65,29,173
        ,62,29,141
CF 410  DATA 64,29,173,61,29,14
        1,63,29,169
KH 420  DATA 0,133,251,169,151,
        133,252,169,26
BK 430  DATA 77,58,29,141,58,29
        ,208,2,169
GB 440  DATA 34,141,250,28,141,
        10,29,173,58
AJ 450  DATA 29,208,23,165,254,
        240,19,198,254
GF 460  DATA 160,7,185,42,29,15
        3,26,29,185
HP 470  DATA 50,29,153,34,29,13
        6,16,241,160
QX 480  DATA 0,177,251,41,15,17
        0,189,26,29
XC 490  DATA 145,251,169,2,133,
        253,160,250,177
PC 500  DATA 251,41,15,170,189,
        26,29,145,251
FG 510  DATA 136,208,243,198,25
        2,198,253,208,237
ME 520  DATA 76,191,234,0,1,2,3
        ,4,5
FE 530  DATA 6,7,0,1,2,3,4,5,6
KX 540  DATA 7,0,1,2,3,4,5,6,7
RF 550  DATA 0,1,2,3,4,5,6,7,0
KD 560  DATA 0,1,0,0,0,0,0,0
```

Program 3: Power BASIC: Blink Mode—Plus/4 and 16 Version

```
BH 100  PRINT"{CLR}PLEASE WAIT"
        :FORI=15360TO15714:READ
        A:POKEI,A:X=X+A:NEXT
JJ 110  IFX<>31259THENPRINT"ERR
        OR IN DATA.":STOP
HM 120  PN$="BLINKOBJ":FORJ=1TO
        LEN(PN$):POKE207+J,ASC(
        MID$(PN$,J,1)):NEXTJ
SP 130  PRINT"{DOWN}{RVS}D{OFF}
        ISK OR {RVS}T{OFF}APE?
        {SPACE}";:DEVICE=8
JP 140  GETA$:IFA$="T"THENDEVIC
        E=1:GOTO160
XG 150  IFA$<>"D"THEN140
QH 160  PRINTA$:POKE2034,15:POK
        E2035,DEVICE:POKE2036,2
        55:SYS65466
RB 170  POKE2034,LEN(PN$):POKE2
        035,208:POKE2036,0:SYS6
        5469
RH 180  BA=15360:HI=INT(BA/256)
        :LO=BA-(HI*256):POKE252
        ,LO:POKE253,HI
EC 190  EA=15715:HI=INT(EA/256)
        :LO=EA-(HI*256)+1:POKE2
        034,252:POKE2035,LO:POK
        E2036,HI
MK 200  PRINT"{DOWN}SAVING ML V
        ERSION OF ";PN$:SYS6549
        6
EJ 210  DATA 32,113,152,120,42,
        42,176,21,42,176
XJ 220  DATA 32,42,176,42,42,17
        6,87,42,176,54
DF 230  DATA 42,176,101,42,176,
        108,168,144,121,74
GK 240  DATA 74,141,94,61,140,9
        3,61,238,97,61
BE 250  DATA 56,176,105,169,206
        ,141,21,3,169,14
DM 260  DATA 141,20,3,56,176,92
        ,169,60,141,21
DX 270  DATA 3,169,156,141,20,3
        ,169,26,141,90
DA 280  DATA 61,56,176,74,152,4
        1,15,170,152,41
RS 290  DATA 240,74,74,74,74,15
        7,42,61,157,74
DC 300  DATA 61,170,152,41,15,1
        57,26,61,157,58
XS 310  DATA 61,56,176,44,152,4
        1,15,170,168,189
DP 320  DATA 42,61,170,152,153,
        74,61,138,157,58
XB 330  DATA 61,56,176,22,152,4
        1,15,170,188,42
FB 340  DATA 61,56,176,16,160,1
        5,152,153,74,61
```

```
HA 350 DATA 153,58,61,136,16,2
       46,230,211,160,1
FM 360 DATA 169,0,88,108,244,2
       ,173,97,61,208
FF 370 DATA 10,206,95,61,208,1
       13,206,96,61,16
ME 380 DATA 108,48,3,206,97,61
       ,173,94,61,141
RR 390 DATA 96,61,173,93,61,14
       1,95,61,169,0
CG 400 DATA 133,208,169,11,133
       ,209,169,26,77,90
KM 410 DATA 61,141,90,61,208,2
       ,169,42,141,250
RR 420 DATA 60,141,10,61,173,9
       0,61,208,23,165
MH 430 DATA 211,240,19,198,211
       ,160,15,185,58,61
PK 440 DATA 153,26,61,185,74,6
       1,153,42,61,136
CR 450 DATA 16,241,160,0,177,2
       08,41,15,170,189
KG 460 DATA 26,61,145,208,169,
       4,133,210,160,232
RM 470 DATA 177,208,41,15,170,
       189,26,61,145,208
PM 480 DATA 136,208,243,198,20
       9,198,210,208,237,76
SF 490 DATA 14,206,0,1,2,3,4,5
       ,6,7
CR 500 DATA 8,9,10,11,12,13,14
       ,15,0,1
JP 510 DATA 2,3,4,5,6,7,8,9,10
       ,11
PM 520 DATA 12,13,14,15,0,1,2,
       3,4,5
BK 530 DATA 6,7,8,9,10,11,12,1
       3,14,15
QG 540 DATA 0,1,2,3,4,5,6,7,8,
       9
FP 550 DATA 10,11,12,13,14,15,
       0,0,1,0
KS 560 DATA 0,0,0,0,0
```

Program 4: Power BASIC: Blink Mode—Demo 1

```
BA 99 IFA=0THENA=1:LOAD"BLINKO
      BJ",8,1
EK 100 REM POKE56,28:POKE55,0:
       CLR FOR VIC, POKE56,60:
       POKE55,0:CLR FOR +4/16
CJ 110 V1=785:V2=786:CO=646:HI
       =192:REM FOR +4/16, V1=
       1281:V2=1282:CO=1339:HI
       =60
EC 120 REM FOR VIC V1=1:V2=2:C
       O=646:HI=28
JA 130 POKEV1,0:POKEV2,HI
FG 140 REM ** USR() IS AT $C00
       0, $3C00 ON THE +4/16,
       {SPACE}$1C00 FOR VIC **
KX 150 SD=16384: REM ** SET DE
       LAY FLAG
FF 160 DB=8192 : REM ** DISABL
       E BLINK
XG 170 EB=4096 : REM ** ENABLE
        BLINK
SM 180 SB=2048 : REM ** STOP C
       OLOR FROM BLINKING
RD 190 MB=1024 : REM ** MAKE C
       OLOR START BLINKING
EQ 200 VB=512{2 SPACES}: REM *
       * RETURN VALUE OF BLINK
       ING COLOR
RF 210 RC=256{2 SPACES}: REM *
       * RESET ALL COLORS-NO B
       LINKING
PJ 220 REM *** NOW WE DEMONSTR
       ATE BLINK
EC 230 RD$="-{BLK}**** RED ***
       *{BLU}-":GR$="-{BLK}***
        GREEN ***{BLU}-":PRINT
       "{CLR}"
PG 240 POKE 53281,0:POKE 53280
       ,0:REM MAKE BACKGROUND
       {SPACE}BLACK
CM 250 REM COLOR 0,1,7:COLOR 4
       ,1,7 FOR +4/16 IN LINE
       {SPACE}240
FG 260 REM POKE36879,8 FOR VIC
        IN LINE 240
PA 270 X=USR(EB):IF X=0 THEN53
       0: REM ** ENABLE BLINKM
       ODE
BB 280 C$=RD$
KF 290 GOSUB450
QF 300 X=USR(MB+(16*2)+0):REM
       {SPACE}** BLACK BLINKS
       {SPACE}TO RED
PD 310 X=USR(MB+(16*3)+1):REM
       {SPACE}* WHITE BLINKS T
       O CYAN
SR 320 X=USR(MB+(16*7)+4):REM
       {SPACE}** MAKE PURPLE B
       LINK TO YELLOW
HD 330 X=USR(SD+14): REM ** SE
       T BLINK SPEED
RD 340 PRINT:PRINT"{PUR}
       {3 SPACES}*** WARNING *
       ** "
RK 350 PRINT:PRINT"{WHT}HIT A
       {SPACE}KEY TO CHANGE"
XG 360 GOSUB530
FP 370 X=USR(SB+0):REM **
       {2 SPACES}STOP BLACK FR
       OM BLINKING TO RED
DG 380 X=USR(VB+0):IF X<>0 THE
       N380:REM ** WAIT UNTIL
       {SPACE}BLACK RESET
QR 390 X=USR(MB+(16*5)+0):REM
       {SPACE}** NOW BLINK BLA
       CK TO GREEN
HM 400 C$=GR$:GOSUB450
GP 410 GOSUB530
AQ 420 X=USR(SB+0):REM **
       {2 SPACES}STOP BLACK FR
       OM BLINKING TO GREEN
XC 430 X=USR(VB+0):IF X<>0 THE
       N430:REM ** WAIT UNTIL
       {SPACE}BLACK RESET
PB 440 GOTO280
CB 450 PRINT"{HOME}{WHT}ATTENT
       ION - ATTENTION":PRINT
HC 460 PRINT"{BLK}{3 SPACES}CO
       NDITION{2 SPACES}CODE "
KE 470 PRINT"{BLU}{3 SPACES}U*
       ************I "
RC 480 PRINT"{BLU}{3 SPACES}-
       {13 SPACES}- "
RF 490 PRINT"{3 SPACES}"C$
AD 500 PRINT"{BLU}{3 SPACES}-
       {13 SPACES}- "
DX 510 PRINT"{BLU}{3 SPACES}J*
       ************K "
EG 520 RETURN
SM 530 TX=10:TY=20
CJ 540 GET A$:TY=TY-1:IF TY<0
       {SPACE}THEN TY=20:X=USR
       (SD+TX):TX=TX-1:IF TX=0
        THEN TX=1
FG 550 CT$=" ":IF TX/2=INT(TX/
       2)THEN CT$="Q"
EQ 560 PRINT"{HOME}{16 DOWN}"
CG 570 X=USR(VB+0):REM ** NOW
       {SPACE}FIND THE COLOR B
       LACK IS BLINKING TO
AR 580 POKECO,X:REM ** CHANGE
       {SPACE}CURRENT CHARACTE
       R COLOR TO BLINKING COL
       OR
AR 590 PRINTTAB(TY);CT$;
KB 600 IF A$="" THEN540
QD 610 X=USR(SD+14):RETURN
```

Program 5: Power BASIC: Blink Mode—Demo 2

```
BA 99 IFA=0THENA=1:LOAD"BLINKO
      BJ",8,1
EK 100 REM POKE56,28:POKE55,0:
       CLR FOR VIC, POKE56,60:
       POKE55,0:CLR FOR +4/16
HF 110 NU=15:REM NU=7 FOR VIC
GP 120 V1=785:V2=786:CO=646:HI
       =192:REM FOR +4/16, V1=
       1281:V2=1282:CO=1339:HI
       =60
AF 130 REM FOR VIC V1=1:V2=2:C
       O=646:HI=28
QH 140 POKEV1,0:POKEV2,HI
DR 150 REM ** CHANGE THESE VAL
       UES TO CHANGE THE BLINK
        COLORS
AJ 160 DIMCT(NU)
JF 170 FORI=0TONU:CT(I)=NU-I:N
       EXT
PG 180 REM ** USR() IS AT $C00
       0 FOR 64, $3C00 FOR +4/
       16, $1C00 FOR VIC **
KQ 190 SD=16384: REM ** SET DE
       LAY FLAG
MD 200 DB=8192 : REM ** DISABL
       E BLINK
QE 210 EB=4096 : REM ** ENABLE
        BLINK
PE 220 SB=2048 : REM ** STOP C
       OLOR FROM BLINKING
PR 230 MB=1024 : REM ** MAKE C
       OLOR START BLINKING
EK 240 VB=512{2 SPACES}: REM *
       * RETURN VALUE OF BLINK
       ING COLOR
RA 250 RC=256{2 SPACES}: REM *
       * RESET ALL COLORS-NO B
       LINKING
PP 260 REM *** NOW WE DEMONSTR
       ATE BLINK
MF 270 X=USR(DB): REM ** MUST
       {SPACE}DISABLE BLINKMOD
       E FIRST
GB 280 PRINT"{CLR}"
DD 290 POKE53280,0:POKE53281,0
       :REM MAKE BACKGROUND BL
       ACK
SP 300 REM FOR +4/16 - COLOR 0
       ,1,7:COLOR 4,1,7 IN LIN
       E 290
CM 310 REM FOR VIC - POKE36879
       ,8 IN LINE 290
KB 320 FOR L=0 TO NU: REM ** S
       ET ALL THE COLORS
AB 330 CL=CT(L)
QE 340 X=USR(MB+(CL*16)+L): RE
       M ** SET THE COLOR TO B
       LINK TO
KA 350 POKECO,L:REM ** CHANGE
       {SPACE}CURRENT COLOR TO
        X
RM 360 PRINT"BLINKING FROM"L"T
       O"CL
PX 370 NEXT L
JB 380 X=USR(SD+60): REM * SET
        BLINK FOR 1 SECOND
HM 390 PRINT:PRINT"HIT A KEY T
       O START"
BK 400 GETA$:IFA$="" THEN400
FB 410 X=USR(EB)
JX 420 END
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Snapshot

See instructions in article on page 76.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Snapshot

```
C124:78 AD 15 03 C9 C1 F0 20 79
C12C:8D E8 C1 AD 14 03 8D E7 73
C134:C1 A9 64 8D 14 03 A9 C1 2A
C13C:8D 15 03 A0 00 8C 36 C7 9C
C144:AD 63 C1 D0 03 20 4E C1 B3
C14C:58 60 98 99 00 C0 C8 D0 26
C154:FA A9 FF 8D FE C0 A9 BF A6
C15C:8D FF C0 8D 63 C1 60 00 7A
C164:AD 36 C7 D0 07 AD 8E 02 60
C16C:C9 04 F0 03 4C E6 C1 A5 4B
C174:C5 CD 13 C1 F0 6C 8D 13 34
C17C:C1 C9 14 F0 1B C9 29 F0 28
C184:1D C9 0D F0 1F C9 2A F0 1F
C18C:21 C9 12 F0 23 C9 21 F0 D7
C194:25 C9 15 F0 27 4C E6 C1 C8
C19C:20 C6 C1 4C 0D C3 20 C6 5D
C1A4:C1 4C C0 C4 20 C6 C1 4C 6C
C1AC:F9 C7 20 C6 C1 4C 12 C8 BB
C1B4:20 C6 C1 4C DF C5 20 C6 14
C1BC:C1 4C F2 C6 20 C6 C1 4C EA
C1C4:67 C2 BA FE 01 01 D0 03 A4
C1CC:FE 02 01 E8 E8 8E 16 C1 6E
C1D4:A9 20 48 48 48 48 8D 36 77
C1DC:C7 85 CC 20 F1 C2 A9 36 65
C1E4:85 01 4C 31 EA 20 FF C2 A2
C1EC:A0 00 8C 36 C7 BA EC 16 CE
C1F4:C1 F0 04 68 4C F1 C1 AE F8
C1FC:37 C7 D0 06 68 A8 68 AA E9
C204:68 40 8C 37 C7 60 A2 00 D7
C20C:84 0B AD 37 C7 F0 04 AC 76
C214:14 C1 60 85 CC 86 0D 20 33
C21C:E4 FF A6 0D C9 0D F0 1A 38
C224:C9 14 D0 05 CA 10 0C 30 DC
C22C:EE 29 7F C9 20 90 E6 9D AE
C234:00 C1 E8 20 D7 C2 E4 0B E7
C23C:D0 DB A9 0D 20 D7 C2 8A 97
C244:D0 03 4C E9 C1 A8 A9 20 3F
C24C:9D 00 C1 60 AD FE C0 85 4F
C254:04 85 08 AD FF C0 85 05 2C
C25C:85 09 A0 00 20 71 C4 20 6B
C264:71 C4 60 20 50 C2 20 C0 70
C26C:C2 85 02 8D 65 C3 86 03 18
C274:8E 69 C3 AD 86 02 85 0D 43
C27C:A2 02 CA E4 0D F0 FB 8E 2E
C284:86 02 AD 21 D0 29 0F CD AC
C28C:86 02 F0 EE 84 CC 20 E4 5F
C294:FF F0 FB C9 0D F0 06 20 CA
C29C:D7 C2 4C 92 C2 A0 00 85 8F
C2A4:CC 20 C0 C2 18 69 02 90 D7
C2AC:01 E8 8D 63 C4 8E 69 C4 CC
C2B4:98 20 D7 C2 A5 0D 8D 86 B8
C2BC:02 4C 3B C3 18 A5 D1 65 5A
C2C4:D3 08 20 71 C4 28 48 A5 4E
C2CC:D2 69 00 20 71 C4 AA 68 74
C2D4:60 85 01 A4 CF F0 0A A0 4D
C2DC:01 84 CD A4 A2 C4 A2 F0 66
C2E4:FC 20 D2 FF A0 02 84 CD 2F
C2EC:A0 00 84 CF 60 A0 00 B9 8F
C2F4:00 00 99 7C C9 C8 C0 0F 77
C2FC:D0 F5 60 A0 00 B9 7C C9 28
C304:99 00 00 C8 C0 0F D0 F5 BE
C30C:60 20 50 C2 84 02 8C 65 AC
C314:C3 98 20 71 C4 AD 88 02 AE
C31C:85 03 20 71 C4 A2 EA 8E 57
C324:63 C4 CA CA 8A 20 71 C4 11
C32C:AD 88 02 18 69 03 8D 69 4A
C334:C4 20 71 C4 8C 69 C3 84 B6
C33C:0A 84 0C 8C 15 C1 20 95 B9
C344:C4 85 0B C9 00 F0 50 20 12
C34C:95 C4 85 0E A5 0B C5 0E 54
C354:F0 36 20 71 C4 A5 0E 85 5B
C35C:0B F0 3C 4C 4B C3 84 0A 6E
C364:A9 00 85 02 A9 00 29 03 34
C36C:09 D8 85 03 85 0C AD 69 B0
C374:C4 29 03 09 D8 8D 69 C4 2E
C37C:20 CD C5 A5 04 91 08 A5 B6
C384:05 C8 91 08 88 4C 42 C3 31
C38C:EE 15 C1 20 95 C4 C5 0B 61
C394:D0 26 EE 15 C1 F0 2B 20 85
C39C:95 C4 C5 0B F0 F4 85 0E FD
C3A4:A9 00 20 71 C4 A5 0B 20 0F
C3AC:71 C4 AD 15 C1 20 71 C4 5B
C3B4:A9 00 8D 15 C1 4C 59 C3 C9
C3BC:85 0E A5 0B 8D 15 C1 4C 80
C3C4:AB C3 CE 15 C1 4C A2 C3 86
C3CC:68 68 AD 15 C1 F0 08 85 11
C3D4:0E CE 15 C1 4C A4 C3 A5 F7
C3DC:0C D0 03 4C 62 C3 A9 20 59
C3E4:85 02 84 0A A9 D0 85 03 7F
C3EC:20 95 C4 20 71 C4 20 95 F8
C3F4:C4 20 71 C4 20 95 C4 20 62
C3FC:71 C4 A9 00 20 5F C7 A0 52
C404:03 20 0A C2 AC FD C0 C8 2C
C40C:C8 AD FE C0 99 00 C0 C8 68
C414:AD FF C0 99 00 C0 C8 8C 47
C41C:FD C0 A5 04 8D FE C0 A5 59
C424:05 8D FF C0 20 B3 C6 C0 BD
C42C:FF F0 03 20 08 C6 AC FD 07
C434:C0 88 88 88 88 C0 FB B0 C9
C43C:0F AD 00 C1 99 00 C0 AD D0
C444:01 C1 99 01 C0 4C E9 C1 CE
C44C:8C FD C0 A9 3A 20 5F C7 27
C454:4C E9 C1 91 02 A6 02 E8 67
C45C:86 02 D0 02 E6 03 E0 EA D3
C464:D0 0A A6 03 E0 07 90 04 26
C46C:A9 01 85 0A 60 91 04 A6 54
C474:04 D0 02 C6 05 CA 86 04 45
C47C:E4 37 D0 14 A6 05 E4 38 EC
C484:D0 0E E6 04 D0 02 E6 05 78
C48C:A9 2B 20 5F C7 4C E9 C1 B4
C494:60 A5 0C F0 1A B1 02 29 0D
C49C:0F 85 0D A6 0A D0 1A 20 03
C4A4:59 C4 B1 02 0A 0A 0A 0A F8
C4AC:18 65 0D 20 59 C4 60 B1 8F
C4B4:02 20 59 C4 A6 0A D0 01 BE
C4BC:60 4C CC C3 A9 00 20 5F 4C
C4C4:C7 A0 03 20 0A C2 20 B3 0C
C4CC:C6 C0 FF D0 08 A9 48 20 8E
C4D4:5F C7 4C E9 C1 B9 00 C0 DD
C4DC:85 04 B9 01 C0 85 05 A0 38
C4E4:00 20 C0 C5 85 09 20 C0 3C
C4EC:C5 85 08 20 C0 C5 85 02 E7
C4F4:85 06 20 C0 C5 85 03 29 46
C4FC:03 09 D8 85 07 20 C0 C5 BD
C504:8D 63 C4 20 C0 C5 8D 69 6B
C50C:C4 84 0A 84 0E A9 02 85 45
C514:0F 20 C0 C5 C9 00 F0 2B FE
C51C:20 57 C4 A5 0A D0 0A C6 EE
C524:0F D0 EE 20 69 C5 4C 15 5B
C52C:C5 C6 0F D0 06 20 69 C5 84
C534:4C 99 C5 A9 60 8D 7E C5 9B
C53C:20 69 C5 A9 4A 8D 7E C5 D0
C544:4C 99 C5 20 C0 C5 85 0B 4A
C54C:20 C0 C5 85 0D E6 0D A5 EC
C554:0B 20 57 C4 C6 0D F0 C3 B4
C55C:C6 0F D0 F3 20 69 C5 4C E6
C564:53 C5 4C 1F C5 A6 0E F0 5C
C56C:07 A5 0C C6 0E 4C 7B C5 31
C574:20 CB C5 C9 00 F0 0F 20 5A
C57C:D6 C5 4A 4A 4A 4A 20 D6 65
C584:C5 A2 02 86 0F 60 20 CB 4A
C58C:C5 85 0C 20 CB C5 85 0E 6E
C594:A5 0C 4C 7B C5 AC BC C5 57
C59C:D0 1F A9 20 85 02 A9 D0 E7
C5A4:85 03 20 CB C5 20 57 C4 96
C5AC:A6 02 E0 25 B0 0B 4A 4A 0B
C5B4:4A 4A 20 57 C4 4C A6 C5 DB
C5BC:00 4C E9 C1 B1 04 A6 04 A3
C5C4:D0 02 C6 05 C6 04 60 B1 1B
C5CC:08 A6 08 D0 02 C6 09 C6 18
C5D4:08 60 91 06 E6 06 D0 02 02
C5DC:E6 07 60 A9 00 20 5F C7 4B
C5E4:A0 03 20 0A C2 A9 2A 20 57
C5EC:DD C6 A9 AC 20 DD C6 20 3F
C5F4:B3 C6 C0 FF D0 08 A9 48 66
C5FC:20 5F C7 4C E9 C1 20 08 CC
C604:C6 4C E9 C1 84 0D 98 18 03
C60C:69 02 CD FD C0 D0 0F B9 89
C614:00 C0 8D FE C0 B9 01 C0 23
C61C:8D FF C0 4C 7B C6 B9 00 B7
C624:C0 85 02 B9 01 C0 85 03 68
C62C:B9 04 C0 85 04 B9 05 C0 D9
C634:85 05 20 8E C6 A4 0D 38 CD
C63C:B9 00 C0 F9 04 C0 85 08 94
C644:B9 01 C0 F9 05 C0 85 09 E5
C64C:88 88 A6 0D E8 E8 BD 00 4C
C654:C0 99 00 C0 C8 E8 EC FD 76
C65C:C0 90 F3 A4 0D 18 B9 00 73
C664:C0 65 08 99 00 C0 C8 B9 94
C66C:00 C0 65 09 99 00 C0 C8 7E
C674:F0 05 C8 C8 4C 61 C6 AD 84
C67C:FD C0 38 E9 04 8D FD C0 F1
C684:A8 A9 20 99 00 C0 99 01 A5
C68C:C0 60 A2 00 A1 04 81 02 09
C694:A5 02 D0 02 C6 03 C6 02 81
C69C:A5 04 D0 02 C6 05 C6 04 14
C6A4:AD FE C0 C5 04 D0 E5 AD 1A
C6AC:FF C0 C5 05 D0 DE 60 A0 D6
C6B4:00 CC FD C0 B0 1E AD 00 9A
C6BC:C1 D9 00 C0 F0 07 C8 C8 AB
C6C4:C8 C8 4C B5 C6 C8 AD 01 83
C6CC:C1 D9 00 C0 F0 09 C8 C8 C3
C6D4:C8 4C B5 C6 A9 FE A8 C8 60
C6DC:60 CD 00 C1 F0 06 CD 01 66
C6E4:C1 F0 01 60 68 68 A0 00 DB
C6EC:20 4E C1 4C E9 C1 A9 93 58
C6F4:20 D2 FF A9 20 AC FD C0 52
C6FC:99 00 C0 C8 C0 FB 90 F8 0C
C704:A2 54 20 56 C7 A0 00 B9 DD
C70C:00 C0 20 D2 FF B9 01 C0 A6
C714:20 D2 FF A2 0D 20 56 C7 EF
C71C:B9 54 C0 20 D2 FF B9 55 17
C724:C0 20 D2 FF A2 0D 20 56 56
C72C:C7 B9 A8 C0 20 D2 FF 4C C7
C734:3B C7 00 00 4C 5E C8 B9 7A
C73C:A9 C0 20 D2 FF A2 04 20 B4
C744:51 C7 C8 C8 C8 C8 C0 54 53
C74C:D0 BD 4C E9 C1 A9 0D 20 CA
C754:D2 FF A9 20 20 D2 FF CA 9B
C75C:D0 FA 60 A8 AD 37 C7 F0 74
C764:05 C0 2B B0 01 60 A9 13 07
C76C:20 D2 FF A2 27 20 56 C7 19
C774:84 0B A0 5D 20 82 C7 A4 32
C77C:0B A9 12 20 D2 FF B9 94 DE
C784:C7 F0 07 20 D2 FF C8 4C 8B
C78C:82 C7 A9 92 20 D2 FF 60 5A
C794:53 43 52 45 45 4E 20 4E 2F
C79C:41 4D 45 3F 00 46 49 4C B4
C7A4:45 20 4E 41 4D 45 3F 00 BA
C7AC:54 41 50 45 20 4F 52 20 18
C7B4:44 49 53 4B 20 28 54 2F 51
C7BC:44 29 00 4D 45 4D 4F 52 DD
C7C4:59 20 49 53 20 46 55 4C 78
C7CC:4C 00 49 4E 44 45 58 20 98
C7D4:49 53 20 46 55 4C 4C 00 BA
C7DC:4E 41 4D 45 20 4E 4F 54 0F
C7E4:20 46 4F 55 4E 44 00 45 1E
C7EC:52 52 4F 52 00 14 20 9D 77
C7F4:94 20 1D 91 00 20 1D C8 17
C7FC:AD FE C0 85 04 AD FF C0 2B
C804:85 05 A9 04 A0 C1 A2 00 60
C80C:20 D8 FF 4C E9 C1 20 1D 5C
C814:C8 A9 00 20 D5 FF 4C E9 A7
C81C:C1 A9 0D 20 5F C7 A0 10 08
C824:20 0A C2 98 A2 00 A0 C1 42
C82C:20 BD FF A9 18 20 5F C7 9F
C834:A2 10 A0 11 20 0C C2 AD A4
C83C:10 C1 C9 44 D0 04 A2 08 A7
C844:D0 06 C9 54 D0 0A A2 01 33
C84C:A9 02 A0 01 20 BA FF 60 A3
```

```
C854:68 68 A9 57 20 5F C7 4C 39
C85C:E9 C1 A0 00 20 F1 C2 AD 63
C864:63 C1 D0 03 20 4E C1 A9 C9
C86C:36 85 01 8D 37 C7 8D 36 9D
C874:C7 BA 8E 16 C1 A0 00 8C E8
C87C:01 C1 20 73 00 8D 37 C7 A6
C884:C9 49 F0 55 85 0D 20 73 D4
C88C:00 20 73 00 F0 C4 99 00 62
C894:C1 C8 20 73 00 F0 10 C9 22
C89C:2C F0 0C C9 24 F0 63 99 E3
C8A4:00 C1 C0 0F D0 EB C8 A9 21
C8AC:20 99 00 C1 8C 14 C1 A5 AE
C8B4:0D C9 4C F0 2C C9 53 F0 F7
C8BC:28 20 FB C8 A5 0D C9 43 AE
C8C4:F0 0B C9 44 F0 0A C9 50 A2
C8CC:F0 09 4C 56 C8 4C 0D C3 5D
C8D4:4C DF C5 4C C0 C4 4C F9 AD
C8DC:C7 20 73 00 D0 FB 4C F2 CA
C8E4:C6 20 73 00 C9 2C F0 F9 2B
C8EC:8D 10 C1 20 FB C8 A5 0D DE
C8F4:C9 4C D0 E2 4C 12 C8 20 23
C8FC:79 00 F0 05 20 73 00 D0 59
C904:FB 60 A5 2D 85 02 A5 2E E2
C90C:85 03 A0 00 AD 01 C1 09 35
C914:80 8D 01 C1 AE 00 C1 8A 0B
C91C:D1 02 F0 06 20 60 C9 4C F9
C924:1B C9 C8 AD 01 C1 D1 02 60
C92C:F0 07 88 20 60 C9 4C 1B EA
C934:C9 C8 B1 02 C9 10 90 02 E6
C93C:A9 0F 8D 14 C1 AA CA C8 72
C944:B1 02 85 04 C8 B1 02 85 B8
C94C:05 A0 00 B1 04 99 00 C1 ED
C954:C8 CA 10 F7 A9 20 99 00 81
C95C:C1 4C AB C8 18 A5 02 69 AA
C964:07 85 02 A5 03 69 00 85 BA
C96C:03 C5 30 B0 01 60 A5 02 DA
C974:C5 2F B0 01 60 4C 54 C8 82
C97C:00 00 00 00 00 00 00 00 10
```

Program 2: Snapshot Demo

```
KQ 100 POKE56,146:CLR:SC=1024:
       CM=54272:XT=0:YT=0:X=0:
       Y=0:R=24:C=39:DIMNA$(31
       )
KQ 110 SNAPSHOT=51000:POKE5328
       0,11:POKE53281,12:GOSUB
       240
AE 120 PRINT TAB(7)"SET UP AND
        COPY SCREENS":FORI=0TO
       1200:NEXT
FX 130 GOSUB240:PRINTTAB(9)"SN
       APSHOT DEMONSTRATION"
EA 140 SYSSNAPSHOT,D,*:REM ERA
       SE OLD SCREENS
BB 150 FORI= 0 TO 31:X=I:Y=0:G
       OSUB250
SQ 160 X=X-1:Y=Y+1:IF X>=0 THE
       N GOSUB250:GOTO160
ME 170 NA$(I)=STR$(I):NA$(I)=R
       IGHT$(NA$(I),LEN(NA$(I)
       )-1):N$=NA$(I)
EM 180 SYSSNAPSHOT,C,N$:NEXT:R
       EM COPY SCREEN
ME 190 GOSUB240:PRINT TAB(8)"S
       NAPSHOT PRINTS SCREENS"
KQ 200 PRINT:PRINT:PRINT TAB(1
       0)"PRESS (STOP) TO END"
       :FORI=0TO3000:NEXT
KJ 210 FORI=0TO31:N$=NA$(I):SY
       SSNAPSHOT,P,N$:NEXT
QA 220 FORI=31TO0STEP-1:N$=NA$
       (I):SYSSNAPSHOT,P,N$:NE
       XT
CX 230 GOTO210
KD 240 PRINT"{CLR}{WHT}":FORI=
       0TO9:PRINT:NEXT:RETURN
CC 250 IF Y>24 THEN300
JX 260 XT=X:YT=Y:CH=78:GOSUB31
       0
XA 270 XT=C-X:CH=77:GOSUB310
JK 280 YT=R-Y:CH=78:GOSUB310
CP 290 XT=X:CH=77:GOSUB310
HJ 300 RETURN
CM 310 P=40*YT+XT+SC:IFPEEK(P)
       =77ORPEEK(P)=78THENCH=8
       6
GD 320 POKEP,CH:POKEP+CM,0
DM 330 RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Mini-Filer

See instructions in article on page 99.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
0801:0B 08 00 00 9E 32 30 36 EC
0809:31 00 00 00 A9 00 8D 20 3A
0811:D0 A9 36 85 01 A9 0C 8D 67
0819:21 D0 8D 86 02 A9 93 20 06
0821:D2 FF A9 0B 8D 21 D0 A9 BC
0829:17 8D 18 D0 A9 11 18 69 63
0831:01 8D B5 10 18 69 04 85 D0
0839:04 85 46 A9 CC 85 06 A9 42
0841:00 85 05 85 03 8D B4 10 73
0849:85 45 8D 87 11 8D 88 11 78
0851:8D 89 11 8D 8A 11 A9 00 71
0859:20 90 FF 20 DA 09 20 E6 C1
0861:08 20 D8 08 20 AF 08 48 31
0869:20 E6 08 68 AE 8D 08 DD 64
0871:8D 08 F0 05 CA D0 F8 F0 35
0879:EB CA 8A 0A AA A9 08 48 78
0881:A9 61 48 BD 9A 08 48 BD E6
0889:99 08 48 60 0B 43 41 46 A5
0891:50 91 11 52 8C 88 93 C6 E9
0899:29 0A 13 0C 66 0D F7 0D 48
08A1:D9 0E F6 0E 15 0F 2F 0F 34
08A9:73 0F CB 09 60 0D 20 E4 9D
08B1:FF F0 FB 60 A9 00 85 FB D7
08B9:A2 04 86 FC AD B4 10 85 A2
08C1:FD AD B5 10 85 FE A0 28 85
08C9:B1 FD 91 FB C8 D0 F9 E6 88
08D1:FE E6 FC CA D0 F2 60 20 9A
08D9:B5 08 A0 00 B1 45 10 01 9E
08E1:60 20 83 09 60 AD 00 04 E8
08E9:C9 CD F0 07 A9 0F A0 FE AA
08F1:4C F5 08 60 85 FC 84 FB D1
08F9:A0 27 A9 A0 99 00 04 88 C0
0901:10 FA A9 13 20 D2 FF A9 36
0909:12 20 D2 FF A0 00 B1 FB EA
0911:F0 06 20 D2 FF C8 D0 F6 0A
0919:A9 92 20 D2 FF 60 A9 27 D1
0921:38 E5 D3 8D B3 10 A0 00 3B
0929:A9 12 20 D2 FF 8C 8B 11 20
0931:A9 A4 20 D2 FF A9 9D 20 74
0939:D2 FF 20 AF 08 C9 0D F0 26
0941:35 C9 14 F0 19 C9 20 90 B2
0949:E4 AC 8B 11 CC B3 10 F0 C1
0951:DC 99 00 02 20 D2 FF A9 4E
0959:00 85 D4 C8 D0 CF AC 8B 9E
0961:11 C0 00 F0 C8 88 A9 20 17
0969:20 D2 FF A9 9D 20 D2 FF ED
0971:20 D2 FF 4C 2E 09 AC 8B 87
0979:11 A9 00 99 00 02 8C B3 EC
0981:10 60 A5 45 85 FB A5 46 6A
0989:85 FC A2 00 8E 84 11 BD 58
0991:B9 10 85 FD BD EB 10 85 58
0999:FE BD 1D 11 8D 86 11 F0 E8
09A1:29 A0 00 8C 85 11 AC 84 87
09A9:11 B1 FB 10 02 A9 20 AC D4
09B1:85 11 91 FD EE 85 11 EE 7B
09B9:84 11 D0 02 E6 FC C8 CC 16
09C1:86 11 D0 E2 E8 BD 1D 11 2D
09C9:D0 C5 60 A9 0F A0 E9 20 4B
09D1:F5 08 20 AF 08 C9 59 D0 CA
09D9:4D A5 03 85 45 85 FD A5 96
09E1:04 85 46 85 FE A0 00 8C 7F
09E9:B2 10 A9 FF 91 FD C8 D0 75
09F1:FB E6 FE A6 FE E0 D0 D0 F3
09F9:F3 AD B4 10 85 FD A2 04 76
0A01:AD B5 10 85 FE A0 28 A9 28
0A09:20 91 FD C8 D0 FB E6 FE 21
0A11:CA D0 F6 A9 00 A2 32 9D C4
0A19:B8 10 9D EA 10 9D 1C 11 30
0A21:9D 4E 11 CA D0 F1 4C E6 34
0A29:08 AD B2 10 F0 01 60 EE 3F
0A31:B2 10 A9 00 8D B6 10 8D CC
0A39:B7 10 20 B5 08 A9 10 A0 34
0A41:27 20 F5 08 AC B7 10 B9 4E
0A49:80 10 85 FB 85 14 B9 99 9B
0A51:10 85 FC 18 69 D4 85 15 AE
0A59:AC B6 10 A9 0F 91 14 B1 A6
0A61:FB 8D B8 10 09 80 91 FB 58
0A69:20 AF 08 AE 9E 0A 48 AC BF
0A71:B6 10 A9 0C 91 14 AD B8 CB
0A79:10 91 FB 68 DD 9E 0A F0 6E
0A81:09 CA D0 F8 20 3B 0B 4C C6
0A89:45 0A CA 8A 0A AA A9 0A 1D
0A91:48 A9 44 48 BD AA 0A 48 36
0A99:BD A9 0A 48 60 0A 91 11 1C
0AA1:9D 1D 13 94 14 A0 0D 85 3A
0AA9:BC 0A C5 0A D0 0A D9 0A 64
0AB1:EC 0A 0B 0B F5 0A 21 0B F5
0AB9:32 0B 78 0B AD B7 10 F0 C6
0AC1:03 CE B7 10 60 AD B7 10 3C
0AC9:C9 17 F0 03 EE B7 10 60 AD
0AD1:AD B6 10 F0 03 CE B6 10 4C
0AD9:60 AD B6 10 C9 27 F0 04 32
0AE1:EE B6 10 60 A9 00 8D B6 42
0AE9:10 4C C6 0A A9 00 8D B6 B1
0AF1:10 8D B7 10 60 20 D1 0A 9A
0AF9:AC B6 10 C8 B1 FB 88 91 C0
0B01:FB C8 C0 27 D0 F5 A9 20 A3
0B09:91 FB 60 A0 27 88 B1 FB B7
0B11:C8 91 FB 88 CC B6 10 D0 2A
0B19:F4 AC B6 10 A9 20 91 FB 99
0B21:60 AD 8D 02 C9 01 D0 05 9D
0B29:A9 A0 4C 4E 0B A9 AE 4C 53
0B31:4E 0B A9 00 8D B6 10 4C 1A
0B39:C6 0A C9 20 90 17 C9 60 45
0B41:90 08 C9 C1 90 0F C9 DB 27
0B49:B0 0B 20 57 0B AC B6 10 7C
0B51:91 FB 20 DA 0A 60 48 29 6C
0B59:80 4A 8D B8 10 68 29 3F 33
0B61:0D B8 10 60 8D B8 10 29 CC
0B69:3F 0E B8 10 2C B8 10 10 2F
0B71:02 09 80 70 02 09 40 60 F6
0B79:68 68 AD B4 10 85 FD AD 1F
0B81:B5 10 85 FE A2 04 86 FC 46
0B89:A9 00 85 FB A0 28 B1 FB E9
0B91:91 FD C8 D0 F9 E6 FC E6 62
0B99:FE CA D0 F2 A9 04 85 FE 92
0BA1:A2 00 86 FD A0 28 B1 FD C0
0BA9:30 0E C8 D0 F9 E6 FE A5 90
0BB1:FE C9 08 D0 F1 4C EF 0B 73
0BB9:48 E0 32 D0 02 F0 2F A5 57
0BC1:FE 9D EB 10 98 18 65 FD 2B
0BC9:9D B9 10 8E 81 11 A2 00 9D
0BD1:B1 FD 10 08 E8 C8 D0 F8 C7
0BD9:E6 FE D0 F4 8A AE 81 11 AF
0BE1:9D 1D 11 68 38 E9 A0 9D FE
0BE9:4F 11 E8 4C A7 0B A9 00 8A
0BF1:8D 82 11 8D 83 11 A0 00 0C
0BF9:B9 1D 11 F0 13 18 6D 82 BB
0C01:11 8D 82 11 AD 83 11 69 6D
0C09:00 8D 83 11 C8 4C F9 0B 7C
0C11:4C E6 08 A9 10 A0 75 20 B2
0C19:F5 08 A5 45 85 FB A5 46 E4
0C21:85 FC A2 00 8E 84 11 BD F5
0C29:B9 10 85 FD 85 14 BD EB 96
0C31:10 85 FE 18 69 D4 85 15 D2
0C39:BD 1D 11 8D 86 11 F0 D0 9D
0C41:A0 00 8C 85 11 8E 81 11 6A
0C49:AC 85 11 A9 0F 91 14 B1 6E
```

```
0C51:FD 8D 8B 11 09 80 91 FD B9
0C59:20 E4 FF F0 FB AE 51 0D 14
0C61:DD 51 0D F0 05 CA D0 F8 5B
0C69:F0 0D CA 8A 0A AA BD 58 0E
0C71:0D 48 BD 57 0D 48 60 C9 63
0C79:20 90 DD C9 80 90 04 C9 36
0C81:A0 90 D5 20 57 0B C9 5B A0
0C89:B0 CE AE 81 11 BC 4F 11 C6
0C91:F0 08 C9 30 90 C2 C9 3A BD
0C99:B0 BE AC 84 11 91 FB EE 4D
0CA1:84 11 D0 02 E6 FC AC 85 84
0CA9:11 91 FD A9 0C 91 14 EE C6
0CB1:85 11 C8 CC 86 11 D0 90 61
0CB9:AE 81 11 E8 BD 1D 11 D0 8F
0CC1:0C AA A5 45 85 FB A5 46 41
0CC9:85 FC 8E 84 11 4C 28 0C 14
0CD1:20 E9 0C EE 84 11 D0 02 F0
0CD9:E6 FC EE 85 11 AD 85 11 36
0CE1:CD 86 11 F0 D3 4C 49 0C 22
0CE9:AC 85 11 A9 0C 91 14 AD F2
0CF1:8B 11 91 FD 60 20 E9 0C 89
0CF9:AD 85 11 F0 0D CE 85 11 3B
0D01:AD 84 11 D0 02 C6 FC CE 36
0D09:84 11 4C 49 0C 20 E9 0C 88
0D11:EE 84 11 D0 02 E6 FC EE 87
0D19:85 11 AD 85 11 CD 86 11 26
0D21:D0 EE AE 81 11 E8 BD 1D 12
0D29:11 F0 03 4C 28 0C A2 00 E3
0D31:A5 45 85 FB A5 46 85 FC 2E
0D39:8E 84 11 4C 28 0C 20 E9 3E
0D41:0C 20 F7 0E 20 D8 08 4C 0A
0D49:14 0C 20 E9 0C 4C E6 08 7A
0D51:05 0D 14 88 85 1D 0D 0D 04
0D59:F5 0C 3E 0D 4A 0D D0 0C 3E
0D61:20 F7 0E 4C 8A 0D A9 10 FB
0D69:A0 65 20 F5 08 AD B2 10 FC
0D71:F0 08 20 1F 09 AC B3 10 6E
0D79:D0 03 4C E6 08 B9 FF 01 DC
0D81:20 57 0B 99 3B 03 88 D0 44
0D89:F4 A5 45 85 FD 85 FB A5 2C
0D91:46 85 FE 85 FC A9 00 8D 84
0D99:8C 11 8D 8D 11 A2 00 A0 7C
0DA1:00 B1 FD DD 3C 03 D0 0A 5F
0DA9:C8 E8 EC B3 10 D0 F2 4C 31
0DB1:E6 08 E6 FD D0 02 E6 FE 59
0DB9:EE 8C 11 D0 03 EE 8D 11 9D
0DC1:AD 8C 11 CD 82 11 D0 D5 A4
0DC9:AD 8D 11 CD 83 11 D0 CD EC
0DD1:A5 46 C5 06 F0 12 AD 82 17
0DD9:11 18 65 45 85 45 A5 46 56
0DE1:6D 83 11 85 46 4C 96 0D AB
0DE9:A5 FB 85 45 A5 FC 85 46 4D
0DF1:A9 10 A0 6B 4C F5 08 A5 9F
0DF9:45 85 FD A5 46 85 FE AD 26
0E01:B2 10 D0 03 4C E6 08 AD 80
0E09:B4 10 18 69 28 85 FB AD 1A
0E11:B5 10 69 00 85 FC A9 00 AC
0E19:8D 85 11 8D 81 11 8D 84 48
0E21:11 20 BD FF A9 01 A2 04 20
0E29:A0 07 20 BA FF 20 C0 FF 09
0E31:A2 01 20 C9 FF AE 81 11 4E
0E39:BD 1D 11 8D 86 11 D0 03 93
0E41:4C C9 0E AC 84 11 B1 FB 4A
0E49:30 2A 20 65 0B 20 D2 FF E0
0E51:EE 84 11 AD 84 11 C9 28 27
0E59:D0 E9 A9 0D 20 D2 FF A9 54
0E61:00 8D 84 11 A5 FB 18 69 39
0E69:28 85 FB A5 FC 69 00 85 E7
0E71:FC 4C 44 0E AC 85 11 B1 D7
0E79:FD 10 02 A9 20 20 65 0B CA
0E81:20 D2 FF EE 84 11 AD 84 99
0E89:11 C9 28 D0 17 A9 0D 20 4C
0E91:D2 FF A9 00 8D 84 11 A5 92
0E99:FB 18 69 28 85 FB A5 FC CD
0EA1:69 00 85 FC EE 85 11 AD 50
0EA9:85 11 CD 86 11 D0 94 A5 89
0EB1:FD 18 6D 86 11 85 FD A5 29
0EB9:FE 69 00 85 FE EE 81 11 CF
0EC1:A9 00 8D 85 11 4C 36 0E F0
0EC9:A9 0D 20 D2 FF 20 D2 FF 55
0ED1:20 CC FF A9 01 20 C3 FF DB
0ED9:60 A5 45 C5 03 D0 07 A5 A3
0EE1:46 C5 04 D0 01 60 A5 45 3A
0EE9:38 ED 82 11 85 45 A5 46 D1
```

```
0EF1:ED 83 11 85 46 60 A0 00 55
0EF9:B1 45 30 17 A5 46 C5 06 8F
0F01:B0 11 A5 45 18 6D 82 11 51
0F09:85 45 A5 46 6D 83 11 85 75
0F11:46 18 60 38 60 A5 03 85 0D
0F19:45 A5 04 85 46 20 F7 0E CC
0F21:20 DA 0E 20 F8 0D 20 F7 FD
0F29:0E 20 F7 0E 90 F2 60 A9 F0
0F31:10 A0 59 20 F5 08 20 1F DB
0F39:09 AD B3 10 D0 03 4C E6 D0
0F41:08 20 F7 0E 90 FB A9 02 15
0F49:A2 08 A0 01 20 BA FF A2 6D
0F51:00 A0 02 AD B3 10 20 BD 8E
0F59:FF A9 10 85 FE A9 B2 85 C5
0F61:FD A9 FD A6 45 A4 46 20 7C
0F69:D8 FF B0 3D A9 10 A0 4F FB
0F71:4C F5 08 A9 10 A0 5F 20 B0
0F79:F5 08 20 1F 09 AD B3 10 01
0F81:D0 03 4C E6 08 20 DA 09 40
0F89:A9 02 A2 08 A0 01 20 BA D5
0F91:FF A2 00 A0 02 AD B3 10 A0
0F99:20 BD FF A9 00 A2 B2 A0 62
0FA1:10 20 D5 FF B0 03 4C 6D 22
0FA9:0F A9 13 20 D2 FF A9 12 1A
0FB1:20 D2 FF A0 27 A9 A0 99 59
0FB9:00 04 88 10 FA A9 0F A8 30
0FC1:A2 08 20 BA FF A9 00 20 A9
0FC9:BD FF 20 C0 FF A2 0F 20 9F
0FD1:C6 FF 20 E4 FF C9 0D F0 D7
0FD9:06 20 D2 FF 4C D3 0F 20 4D
0FE1:CC FF A9 0F 20 C3 FF 60 FC
0FE9:C3 CC C5 C1 D2 3A 20 C1 73
0FF1:52 45 20 59 4F 55 20 53 87
0FF9:55 52 45 3F 00 CD 49 4E 0C
1001:49 2D C6 49 4C 45 52 20 BA
1009:3A C1 2C C3 2C C6 2C D0 1E
1011:2C D2 2C 46 37 2C 46 38 15
1019:2C C3 CC D2 2C 55 50 2C 8A
1021:44 4F 57 4E 3A 00 C3 D2 33
1029:C5 C1 D4 C5 3A 20 C5 4E BF
1031:54 45 52 20 52 45 43 4F 96
1039:52 44 20 46 4F 52 4D 41 9B
1041:54 2C 20 46 31 20 54 4F 01
1049:20 45 58 49 54 00 CE 4F F9
1051:20 C5 52 52 4F 52 53 00 CC
1059:D3 41 56 45 3A 00 CC 4F 8D
1061:41 44 3A 00 C6 49 4E 44 B6
1069:3A 00 CE 4F 54 20 C6 4F 75
1071:55 4E 44 00 C1 C4 C4 20 23
1079:D2 45 43 4F 52 44 00 28 7D
1081:50 78 A0 C8 F0 18 40 68 59
1089:90 B8 E0 08 30 58 80 A8 49
1091:D0 F8 20 48 70 98 C0 EA 33
1099:04 04 04 04 04 04 05 05 BC
10A1:05 05 05 05 06 06 06 06 D0
10A9:06 06 06 07 07 07 07 07 E8
10B1:07 00 00 00 00 00 00 00 55
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

All programs listed in this magazine are available on the GAZETTE Disk. See elsewhere in this issue for details.

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bug-swatter

Modifications and Corrections

• The description of Dictionary Manager, Program 1 of "SpeedCheck" (December 1985), did not explicitly state that this program creates a blank dictionary disk by *formatting* it. If you type in the program, save it to disk, and then run the program on the same disk, that disk will be formatted and your copy of the program lost.

Those readers who are still using the original *SpeedScript* (January 1984) will have to make a minor change to SpeedCheck. After loading the program, enter **POKE 4242, 24**. Then save the modified copy of SpeedCheck.

GAZETTE DISK subscribers may have run into a problem with SpeedCheck. If you want to make the modifications for *WordPro* or *PaperClip* listed in the article, the MLX program on the disk will not allow you to load the program on the disk. The solution is to modify MLX. Note that this is not a permanent change, it's a temporary fix to allow loading of SpeedCheck:

1. Load, but don't run MLX.

2. LIST 845–850 and change the final POKE in 845 to **POKE782,0**. Also, add **POKE781,0: POKE782,192:** to the beginning of line 850.

3. Run MLX and you'll be able to load SpeedCheck to make the *Wordpro* or *Paperclip* modifications.

One more note about SpeedCheck and the GAZETTE DISK: The program requires its own dictionary disk. You cannot load and run it directly from the menu. A program that copies the dictionary files to a new disk is included on the GAZETTE DISK.

• "Auto File" (November 1985) creates a directory reading program called ".DIR." But the program assumes that .DIR is the first program on a disk and the directory it provides doesn't include the first program. This inconvenience can be avoided by moving .DIR to the first place on the directory. Instructions for doing this can be found in the article describing the Auto File program. A quicker solution, however, is to load "Auto File," (do not run), type **POKE 2537,224:POKE 2571, 224** then save the program under a new name. Before running it, you'll have to scratch previously created .DIR files.

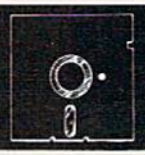
• If you turn on your computer, run "Backgammon" (November 1985) and play a game, then turn your computer off and on, load it again, and run it, you'll find that the dice rolls are exactly the same. To fix this, add a line like **1 X = RND (TI/97)** at the beginning of the program. For a more detailed description of why this is necessary, see the "Gazette Feedback" item on page 12, top right corner, of the November issue.

• A typographical error appeared in the article about "Digi-Clock" (November 1985). When you run the program, the screen displays SYS 682 to re-enable the clock after pressing RUN/STOP–RESTORE. But the article lists SYS 628. The program message is correct.

• Reader Richard D. Kyle has discovered a glitch in "Power Poker" (November 1985). If you should score more than 1000 points in a game and it becomes the new high score, the screen display of any further games will be slightly off because the length of the high score will print in the last column, causing a new line to open up and the screen to scroll. Although Power Poker was tested extensively, no member of our staff was able to attain a score of 1000 or higher.

Lines 390–420 determine the length (LEN) of the high score and position it properly on the screen. You could modify this routine to allow for scores above 1000, or simply subtract one from each SPC( ) function in lines 390–420. This problem does not affect the playability of the game and you needn't make these modifications unless you anticipate scoring over 1000.

DISKS 69¢



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Equivalent Program Segments

```
-------- PROMAL --------
REPEAT
  PROMPT_AT 5,24, "Add/Chg/Quit?"
  IF Reply = 'A'
    ADD Item
    New_Items = New_Items + 1
  ELSE IF Reply = 'C'
    CHANGE Item
UNTIL Reply = 'Q'
```

```
-------- BASIC --------
11910 REM
11920 CL = 5:LN = 24:PR$ = "Add/Chg/Quit?"
11925 GOSUB 9490:REM GET REPLY
11930 IF RP$<>"A" THEN 11950
11940 I9 = IT:GOSUB 10100:REM ADD
11945 NI = NI + 1:GOTO 11920
11950 IF RP$<>"C" THEN 11970
11960 I9 = IT:GOSUB 6050:REM CHG
11970 IF RP$<>"Q" THEN 11920
```

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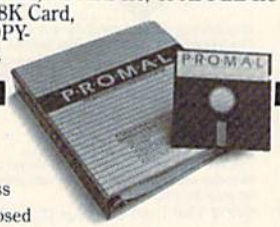

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- Decimal or Hex number types
- Functions & Procedures with passed arguments
- Predefined DATA of any type
- Multi-Dimensional Arrays (any type)
- Strings & pointers
- Control Statements: IF, IF-ELSE, WHILE, FOR, CHOOSE, REPEAT-UNTIL, BREAK, NEXT, INCLUDE, ESCAPE, REFUGE
- Bit-operators, shifts, type casts
- Variables at any memory location
- Simple Machine Language interface
- Recursion supported
- Program chaining and overlays (IMPORT/EXPORT)
- Separate compilation of modules
- Load and run relocatable M/L programs
- Compile errors trapped for Editor

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- Progam abort and pause
- Prior command recall
- I/O Re-direction & batch jobs
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- Memory MAP, SET, and display commands

EDITOR
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- Function key controlled
- Line insert, delete, search
- String search and replace
- Block copy, move, delete & file read/write operations
- Auto indent, undent support

LIBRARY
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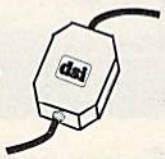

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At last, a program that makes it not only easy but fun to learn music. The Melodian keyboard and software were designed by Harry Mendell who designs custom synthesizer electronics and software for professional musicians such as **Stevie Wonder** and Eric Himy, an award winning concert pianist. The Melodian boasts many of the professional features found only on more expensive equipment. These features include multitrack recording, the ability to create custom instrument sounds and most importantly, ease of use.

Start your lesson with **RhythmMaster** Software. With its built-in metronome, RhythmMaster will display the treble and bass musical staffs and a picture of a piano keyboard. RhythmMaster will then play a measure of music and you must try to play the same measure back on the Melodian keyboard. You're not familiar with the keyboard or can't read music? No problem. RhythmMaster displays the notes you are to play on the musical staff and on the keyboard pictured on the monitor. If you strike the wrong key the note on the musical staff turns red and shows you which key you played wrong, making it ever so easy to correct what you played.

If you should hold a key too long a turtle runs across the screen. Inversely if you should release a key too quickly a rabbit scurries by. If you don't play it correctly RhythmMaster knows it and repeats the measure for you to play.

Sounds easy doesn't it? Now add the fun. You start with six composers (Bach, Handel, Mozart, Beethoven, Schubert and Wagner). The object is to attain the next level of difficulty without losing a composer. You lose a composer each time you accumulate ten mistakes. There are twelve levels of difficulty attainable ranging from tyro to maestro.

ConcertMaster teaches you how to play 35 pre-recorded songs from Bach to Rock. With ConcertMaster you can analyze music note by note, instrument by instrument and learn how a music composition is put together. Then you can compose your own music and record it right onto your floppy disks.

There are nineteen different instrument sounds to choose from in over a seven octave range giving you a wide choice of instruments to suit your musical taste and expression. You can also create your own instrument sounds.

ScoreMaster enables you to print out your music in standard music notation for other musicians to play, or for yourself.

AHOY! Magazine Says . . .

Peggy Herrington of AHOY! said "The system is so easy to use that I didn't need the documation". "It's fun, challenging, and educational, and for playability and ease of use it is nothing short of spectacular."

New York Times Says . . .

Erik Sandberg-Diment of the New York Times states "really useful and instructive item ... Tanya, our 10 year old beginner quickly caught the spirit of matching the dance of her fingers to the measured metronome." "One piece of educational software that, unlike most of its kinfolk, actually delivers. These software-hardware combinations offer a lot of entertainment to the Commodore owner."

RUN Magazine Says . . .

Tom Benford of RUN notes "Whenever a selection of products of the same genre is available, one among the bunch rises head and shoulders above the rest. Such is the case with Melodian ConcertMaster keyboard and software. The combined features of RhythmMaster and ConcertMaster give you a complete music tutorial."

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By selling directly to you, we are able to give you the Melodian Keyboard and Software at far lower prices than ever offered before. You take no risk. **If the Melodian keyboard or any of the programs don't please you, for any reason whatsoever, send it back within 60 days for a full refund!**

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Melodian Musical Keyboard kb-01 — $99.95

Keyboard
40 Keys (A-C) in professional gauge spring loaded to give the feel and response of a real keyboard instrument. Polyphonic.

Registers (with ConcertMaster)
Organ, Trumpet, Flute, Clarinet, Piano, Harpsicord, Violin, Cello, Bass, Banjo, Mandolin, Calliope, Concertino, Bagpipe, Synthesizer 1, Synthesizer 2, Clavier 1, Clavier 2, which can be played over a 7 octave range. Programmable sounds as well.

Recording (with ConcertMaster)
Three track sequencer (recorder) with overdubbing and multitimbral (different instrument sounds at the same time) effects.

Interface
Built in interface for Commodore 64, Commodore 128, plugs right in to joystick port no. 2 and user port.

Power Supply
Powered direct by the computer, no batteries and cords required.

Finish
Table Model in white high-impact material, with carrying handle, protective key cover, and built in music stand. Size 29 -1/8 X 9-9/16 X 3-11/16, weighs 9 pounds.

Melodian ScoreMaster sm-01 — $29.95

With the ScoreMaster program your music can be printed out in music notation, which other musicians can read and play. Any music recorded with the ConcertMaster program can be printed by ScoreMaster.

ScoreMaster Requires:
- Commodore 64 or Commodore 128 with disk drive and printer compatible with the Commodore graphics mode such as the Commodore MPS 803, 1515, and 1525.
- Melodian ConcertMaster program.

RhythmMaster Software rm-01 — $29.95

RhythmMaster teaches a beginner how to read music and play it correctly and in rhythm on the musical keyboard.

RhythmMaster will have you reading and playing musical notes in minutes with fun and excitement.

RhythmMaster Features:
- Trumpet, organ, violin, and synthesizer instrument sounds.
- Built in metronome.
- Pause/Play control.
- Set-up menu for customizing RhythmMaster.

RhythmMaster Teaches:
- How to read notes on the treble and bass musical staffs.
- The names of the notes.
- Where the notes are on the keyboard.
- How to play whole notes, half notes, quarter notes, eighth notes and sixteenth notes in combinations, in both 3/4 and 4/4 time.
- How to play in different tempos.

RhythmMaster Requires:
- Commodore 64 or Commodore 128 with disk drive.
- Melodian Musical Keyboard kb-01 is required to study the reading and playing of musical notes. However, RhythmMaster can be used without the Melodian Musical Keyboard to study rhythm, by playing the notes on the computer keyboard.

Programmer's Tool Kit pt-01 — $29.95

Contains programs, and BASIC source listings for reading the Melodian Musical Keyboard, and for reading and creating music files for Melodian ConcertMaster.

ConcertMaster Software cm-01 — $29.95

ConcertMaster teaches how a composition is put together, note by note, instrument by instrument. You learn to play 35 pre-recorded songs from Bach to Rock. Then you can compose your own songs and record them right onto your floppy disk.

ConcertMaster Teaches:
- Scales
- Bass lines
- Familiar Beginner Songs such as "Jingle Bells"
- Easy classical songs such as "Bach Minuet" and Ravel's "Bolero"
- Advanced classics like "A Midsummer's Night Dream" by Mendelssohn
- Popular hits such as "Thriller"

Instruments Sounds
Organ, Trumpet, Flute, Clarinet, Piano, Harpsicord, Violin, Cello, Bass, Banjo, Mandolin, Calliope, Concertina, Bagpipe, Synthesizer 1, Synthesizer 2, Clavier 1, Clavier 2, which can be played over a 7 octave range. Programmable sounds as well.

Recording Functions:
Three track sequencer (recorder) with overdubbing and multitimbral (different instrument sounds at the same time) effects.
Each track can be set to one of seven different functions:
- **Monitor:** Lets you use a track to play music live, without recording it.
- **Record:** Records a track as you play.
- **Playback:** Lets you hear whatever has been recorded or loaded into the track. You may playback one track while recording another to build layers of instruments.
- **Mute:** Turns a track off. This is useful when you want to listen to or record one or two tracks at a time.
- **Save:** Stores a track to the disk.
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- Choose from pulse, sawtooth, triangle and noise sound sources.
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- Ring Modulation and Syncronization effects.
- Set Low pass, band pass, and high pass filter frequencies.

ConcertMaster Requires:
- Commodore 64 or Commodore 128 with disk drive.
- Melodian Musical Keyboard kb-01 is required to study the reading and playing of musical notes. However, ConcertMaster can be used without the Melodian Musical Keyboard to playback the recorded musical examlpes, record music played on the computer keyboard, and to create new instrument sounds.

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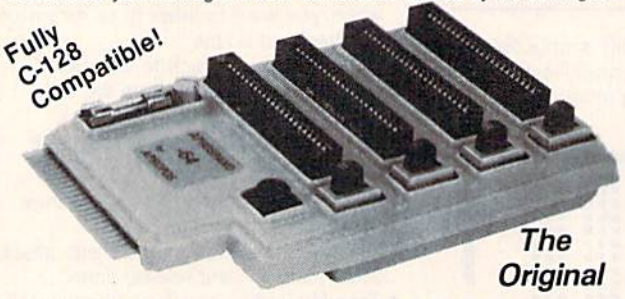

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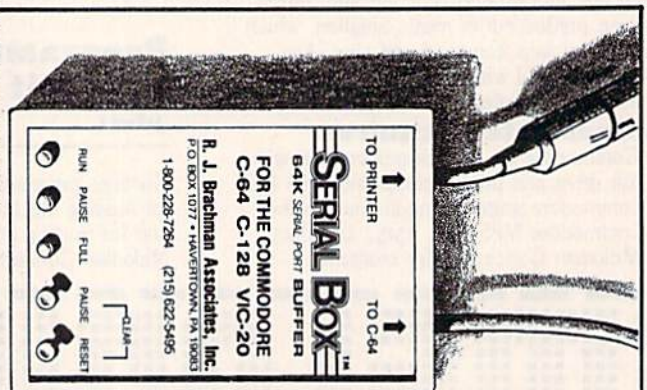

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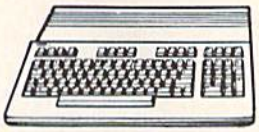

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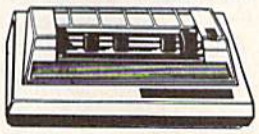

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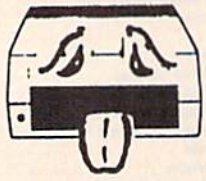

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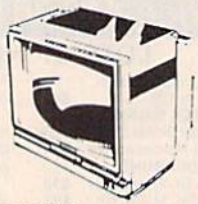

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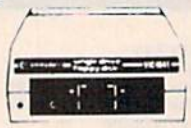

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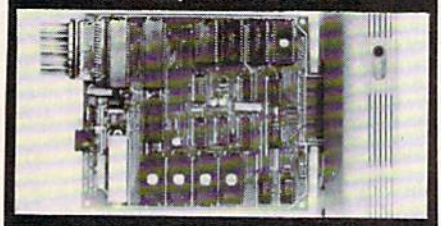

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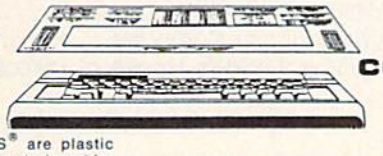

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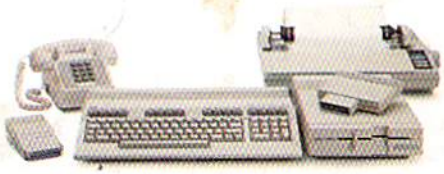

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